# A Report on the NASA Fractional Aircraft Demonstration Program

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# Executive Summary

In October 2000, NASA was directed by Congress to develop a plan to replace the Agency's aging and costly Mission Management Aircraft (MMA) fleet and consider fractional ownership as an alternative. At the same time, Congress directed NASA to undertake a two-year test of fractional ownership, providing $2.2 million for that purpose in the Conference Report (House Report 106-988) accompanying the FY 2001 VA-HUD - Independent Agencies Appropriations Act (P.L. 106-377). The Congress subsequently directed an additional $0.522million for the test of fractional ownership in the Conference Report (House Report 107-272) accompanying the FY 2002 VA-HUD - Independent Agencies Appropriations Act (P.L. 107-73).

After conducting a full and open competition, NASA entered into a contract with Flexjet, a subsidiary of Bombardier, Inc., to provide ½ share (400 hours) of a Learjet 31 and 1/16 share (50 hours) of a Learjet 60 over a two-year period. During that period, NASA personnel flew on Flexjet aircraft for 488 flights and over a quarter-of-a-million nautical miles. The service provided was safe, flexible and highly reliable.

The results of the test program indicate that aircraft fractional ownership can be of value as a supplement to Agency aircraft, but does not offer a cost-effective alternative to Agency ownership and operation. Fractional ownership offers optimum value when demand is highly variable or when the level of demand is less than 150-200 hours per year. When demand is above 300 hours per year, ownership is the most cost effective alternative. NASA does not recommend replacing its fleet of MMA with fractional aircraft services.

NASA recommends that the Agency pursue the implementation of fractional aircraft arrangements with private industry in conjunction with upgrading its fleet of MMA to newer, more cost-effective platforms. A separate study determined that NASA's current MMA fleet consists of aircraft that are too large, too costly to operate, lack modern noise abatement and other technological requirements, are not optimally located to match NASA's demand patterns, and produce insufficient flight hours to keep pace with Agency demand. The study recommended a slightly larger fleet of smaller, newer aircraft that are less costly to operate. NASA does not plan to pursue MMA study recommendations at this time.

# Background

### A. NASA Mission Management Aircraft (MMA) Fleet

For many years, NASA has operated a small fleet of MMA to provide efficient transportation between and among its facilities. Historically, the fleet consisted of several Gulfstream I aircraft, two King Air B200 turboprop aircraft, and a Gulfstream III long-range business jet at NASA Headquarters. These aircraft served NASA well for many years, but by the end of the 1990s the increasing costs of operating and maintaining the aging Gulfstream aircraft caused NASA to look for more cost-effective alternatives.

The NASA-owned MMA fleet consists of two King Air B200s, a Gulfstream I, a Gulfstream III, and three temporary Gulfstream IIs. NASA Headquarters also has use of three FAA aircraft—a Gulfstream IV and two Citation Excels-- through a shared-use agreement.

In addition to its fleet of MMA, NASA operates about 80 research and program support aircraft required to support NASA's various missions in space operations and exploration, aeronautics research, and scientific research. The aviation infrastructure that NASA maintains to support these various mission requirements also supports the relatively small MMA fleet of aircraft.

For comparison purposes, the following information is provided about the current NASA MMA fleet:

- The King Air B200 is a small-cabin, short-range turboprop aircraft that is typically used to transport parties of up to eight passengers on short trips.
- The Gulfstream I is a large-cabin turboprop aircraft used to transport parties of 8 to 12 passengers over distances of up to 1,500 miles. The aircraft was for many years the mainstay of NASA's MMA fleet. However, the 40-year-old aircraft is no longer cost-effective. NASA plans to replace its last remaining Gulfstream-I with a Gulfstream IIB.
- The Gulfstream II is a large-cabin first-generation business jet purchased by Johnson Space Center (JSC) as a future replacement aircraft for its Shuttle Training Aircraft (STA). Three Gulfstream-IIs are temporarily being used as MMA until more suitable replacements can be acquired. The G-II is suitable for transporting up to 12 passengers on coast-to-coast trips. It is costly to operate by comparison with modern jets due to its high fuel consumption and high maintenance requirements. The aircraft does not meet Stage 3 noise requirements.
- The Gulfstream III is a large-cabin, second-generation business jet. The FAA operates a NASA-owned Gulfstream III under a shared-use agreement. The G-III provides accommodations similar to those of the G-II, plus the additional range to fly international trips. However, the aircraft is not Stage 3 certified, which severely limits access to foreign airports.

In addition, NASA has access to three FAA-owned aircraft under a shared-use agreement: one Gulfstream IV and two Citation Excels.

- The midsize Citation Excels are ideal for transporting up to six or seven passengers on trips of up to 1,500 miles. They are economical to operate, fully compliant with current air navigation and safety equipment, and certified to Stage 3 noise regulations.
- The large-cabin, long-range Gulfstream IV is the best choice of available aircraft for international travel. The aircraft is Stage 3 certified.

**Table 2-1. The Current MMA Fleet.**

| Aircraft | Typical Pax Seats | Cabin Volume | IFR Range (NM) Seats Full | Normal Cruise Speed (kts) |
|---|---|---|---|---|
| King Air B200 | 7 | 303 | 920 | 283 |
| Citation Excel | 7 | 461 | 1,550 | 433 |
| Gulfstream I | 10-12 | 1,100 | 1,520 | 298 |
| Gulfstream II | 10-12 | 1,269 | 2,625 | 475 |
| Gulfstream III | 11-13 | 1,345 | 3,460 | 478 |
| Gulfstream IV | 11-13 | 1,513 | 3,800 | 476 |

(Cabin volume is expressed in cubic feet.)

### B. MMA Fleet Plans

NASA completed the Agency's plan to modernize its MMA fleet in June 2004, with the assistance of Conklin & deDecker Associates of Dallas, Texas. NASA's objective in the 2004 plan was to update and revise the 1999 study, *The Mission Management Aircraft Fleet Plan June 1999,* to compare acquisition alternatives and to revise alternatives for upgrading the NASA MMA fleet. The *Mission Management Aircraft Fleet Plan 2004* updated the previous report and evaluated current and projected MMA requirements. It recommended replacing all Gulfstream aircraft as soon as possible. The recommended solution was to replace five NASA Gulfstream aircraft (one Gulfstream III, three Gulfstream IIs and one Gulfstream I) with six smaller business jets. The study postulated that these actions would provide a 23% increase in mission capability while simultaneously providing a 38% reduction in cost per mile compared to the current fleet. The plan recommended retaining the two King Airs operated from the NASA Dryden Flight Research Center and the NASA Wallops Flight Facility and made other specific cost-reduction measures.

The 2004 MMA Plan explores a number of alternative solutions for meeting NASA's MMA requirements by replacing current aircraft with a fleet of new (or nearly new) aircraft that are better suited to NASA's needs and are more cost-effective to operate. All of the aircraft evaluated are current production aircraft with modern avionics, the latest safety equipment, and efficient engines that meet Stage 3 noise requirements. Table 2-2 lists some of the aircraft types available.

NASA does not plan to pursue these recommendations at this time.

**Table 2-2. Potential MMA Replacement Aircraft**

| Aircraft | Typical Pax Seats | Cabin Volume | IFR Range (NM) Seats Full | Normal Cruise Speed (kts) |
|---|---|---|---|---|
| Citation Bravo | 7 | 278 | 1,290 | 405 |
| Citation Encore | 7 | 307 | 1,410 | 430 |
| Citation XLS | 7-8 | 461 | 1,566 | 433 |
| Citation Sovereign | 8-9 | 620 | 2,535 | 459 |
| Citation X | 8-9 | 593 | 2,890 | 525 |
| Hawker 800XP | 7-8 | 604 | 2,470 | 424 |
| Hawker Horizon | 8-9 | 757 | 3,000 | 470 |
| Gulfstream 200 | 8-10 | 868 | 3,150 | 459 |
| Gulfstream 400 | 11-13 | 1,525 | 3,880 | 476 |
| Falcon 2000EX | 8-9 | 1,024 | 3,700 | 445 |
| Emb. Legacy Executive | 11-13 | 1,410 | 3,186 | 443 |

The plan also left open the possibility of meeting some of NASA's MMA requirements with fractional aircraft services, but did not make specific recommendations in that regard. Those recommendations were deferred until completion of the two-year fractional aircraft demonstration program.

The 2004 MMA Plan also provided comparative life cycle cost projections for the current MMA baseline and for three modernization alternatives.

### C. Legislation

The Conference Report (House Report 106-988) accompanying the FY 2001 VA-HUD - Independent Agencies Appropriations Act (P.L. 106-377) contained direction for NASA to spend $2.2 million to perform a 2-year test of aircraft fractional ownership.

*The conferees are aware that NASA owns and operates a small fleet of administrative aircraft that are vital for the oversight and implementation of its mission. The conferees understand that the majority of the aircraft in this fleet are aging, presenting a burden upon NASA management in terms of maintenance requirements and resultant costs. The conferees, therefore, direct that NASA develop a plan to replace these aging administrative aircraft and consider fractional ownership as an alternative. NASA should submit this plan for administrative aircraft replacement to the Committees on Appropriations of the House and Senate by April 15, 2001. The conferees continue to believe that fractional ownership may be of value to NASA and have therefore included $2,200,000 to be used for a two-year test of the concept. NASA is directed to enter into a fractional ownership contract, to be fully implemented, by June 15, 2001.*

The Conference Report (House Report 107-272) accompanying the FY 2002 VA-HUD - Independent Agencies Appropriations Act (P.L. 107-73) provided an additional $522,000 for the test effort. Thus, the total funding available for use by the aircraft fractional demonstration program was $2.717M.

### D. Industry Fractional Aircraft Programs

Fractional aircraft ownership is a concept under which an aircraft management company facilitates the sale of shares of an aircraft to a number of co-owners, who in turn employ the management company to operate the aircraft on their behalf under a dry lease exchange agreement. Typically, each fractional owner purchases an undivided interest in a specific, serial-numbered aircraft based on 800 occupied hours per year for each aircraft. Each owner is guaranteed 50 occupied hours annually for each 1/16 share that is purchased.

Industry fractional aircraft providers control costs by utilizing every aircraft to the maximum extent possible. A fractional aircraft typically flies for its nominal six owners 800 occupied flight hours annually, plus an additional 200+ hours for aircraft positioning flights, test flights, and other non-revenue flights. Owners are charged only for hours in which they actually occupy the aircraft, or *occupied hours*, however the cost of repositioning flights, etc., is charged indirectly in the occupied hourly rate. Aircraft repositioning before or after each flight is the industry norm, but the practice is kept to a minimum by providing service to the customer with the nearest available aircraft. Using a large national fleet of aircraft, a fractional provider, using careful scheduling, can ensure that a minimum number of costly flights to reposition aircraft are necessary. The owner of a typical business jet must do the same repositioning if the passengers are not collocated with the aircraft, but the frequency and distances required for these moves are typically greater, on average, than those found in a fractional aircraft operation.

Flexibility has been a hallmark of fractional aircraft programs. Each shareowner has access to the entire fleet of aircraft. A fractional owner has the flexibility to use multiple aircraft simultaneously to meet surge demand. The fractional owner can use a different aircraft from the one actually purchased, as needed, by exchanging hours at given exchange ratios for different aircraft types. The fractional provider can also upgrade a customer to a larger aircraft at its discretion at no additional cost to the customer. Fractional providers operate a core fleet of charter aircraft that can provide backup services whenever one of the “owned” aircraft is not available for the customer.

Moreover, in a fractional ownership arrangement, the owner has access to every other owner’s aircraft. All owners must participate in an Interchange Agreement, which allows all owners to fly on other owners’ fleet aircraft. Because of this feature, the fractional provider can normally maintain for the customer an aircraft availability rate of close to 100%.

Because of the Interchange Agreement, a fractional owner can choose to upgrade to a larger aircraft or to an aircraft with longer range. However, the fractional provider offers this feature only if it has a larger aircraft available. Part of the Interchange Agreement allows the fractional provider to substitute alternate aircraft when it is to the company’s advantage to do so, but only when the substitute aircraft has greater capability than the one requested by the owner.

The fractional owner buys into more than ownership of just a fraction of an aircraft or the sharing of an aircraft. In addition to the fraction of the aircraft purchased or leased is an inherent and comprehensive operations and maintenance network that operates around the clock. The owner’s aircraft is totally managed by the company. In a typical fractional ownership agreement, there is usually no need for the shareowner to hire additional staff to support aircraft operations.

There are four companies that provide nationwide fractional aircraft programs. Together they have some 870 aircraft and more than 6,000 shareowners. All have expanded rapidly over the

past few years. In addition, there are other providers that offer more limited, regional programs. The four current nationwide providers are:

- **NetJets, a subsidiary of Berkshire Hathaway Inc.** NetJets is the oldest and largest fractional aircraft provider. It originated the fractional ownership concept in 1985. NetJets established the business model that all other fractional providers have followed. It manages over 500 aircraft and 2,900 ownership shares. Headquarters for NetJets is in northern New Jersey. Its main base of operations is in Columbus, Ohio.
  NetJets operates over fifteen types of aircraft, ranging from the Citation Ultra to the Boeing Business Jet. NetJets also owns Executive Jet Management, which provides the bulk of its backup aircraft.

- **Flight Options, 65% owned by Raytheon.** Flight Options was founded in 1998 as a division of Corporate Wings. It is based in Cleveland, Ohio. Flight Options was the first to offer fractional shares in used aircraft. In December 2001, Flight Options combined operations with Raytheon Travel Air, effectively doubling the size of the company. Flight Options is the second largest fractional aircraft provider, with a fleet of 220 new and pre-owned aircraft of ten types ranging from the King Air B200 to the 13-passenger Embraer Legacy. It has sold nearly 2,000 ownership shares of these aircraft.

- **Flexjet, a division of Bombardier Aerospace Co.** Flexjet is based in Richardson, TX. It was founded in 1995, and is a subsidiary of Bombardier Aerospace, the manufacturer of the Learjet 31/45/60, the Challenger 300/604 and the Global Express. All its aircraft are current-production Bombardier products. Flexjet operates about 85 aircraft. Flexjet also has a captive aircraft management company, Business Jet Solutions, which provides the primary fleet of backup aircraft.

- **CitationShares, a joint subsidiary of TAG Aviation and Cessna Aircraft Co.** Based in Greenwich, Connecticut, CitationShares is the smallest (44 aircraft) and newest fractional jet company. The company is 75% owned by Cessna Aircraft Company, a subsidiary of Textron Inc., and 25% owned by TAG Aviation USA, Inc.

  TAG Aviation is one of the largest business aircraft management and charter companies in the United States, while Cessna is the largest manufacturer of small business jets in the world. Its fractional aircraft program, which started in 2000, currently uses the Citation CJ1, Bravo and Excel. The company started as a regional fractional provider that focused on the potential market east of the Mississippi. It has since expanded it service into a nation-wide fractional aircraft provider.

# NASA Fractional Aircraft Demonstration Program

### A. Objectives

The overall objective of the Fractional Aircraft Demonstration Program was to determine if fractional aircraft ownership programs could be suitable alternatives to Government-owned aircraft for meeting NASA's administrative transport requirements. This determination would be made based on a two-year trial of a fractional aircraft program, wherein the costs and benefits of the program would be measured, evaluated, and compared to NASA MMA usage.
The overall objectives of the test program were to:

- Determine whether or not fractional aircraft programs could be cost-effective *alternatives* to Government-owned mission management aircraft, and if so, under what circumstances.
- Determine whether or not fractional aircraft programs would be desirable as cost-effective *supplements* to Government-owned aircraft, and if so, under what circumstances.
- Provide specific recommendations for the next step that the Government should take regarding fractional aircraft programs as they might be related to upgrading its administrative aircraft fleet.

### B. Program Management and Administration

NASA began planning for the implementation of the Congressional direction to conduct a test of fractional ownership upon receipt of the funding in late November 2000. In January 2001, NASA hired Conklin & deDecker Associates of Arlington, Texas, to conduct a study of how best to implement the test at NASA. Mr. Bill deDecker interviewed executives from each of the major fractional providers using a standard list of questions created jointly by C&D and NASA, obtained copies of standard industry contracts, and suggested possible approaches for conducting the study and performing an analysis of the completed study.

NASA Headquarters requested that the Chief of Flight Operations at the NASA Goddard Space Flight Center/Wallops Flight Facility (GSFC/WFF) conduct the procurement and the test and collect metrics to be used for evaluation of the program. The procurement office at WFF prepared a Request for Quotes (RFQ) with the goal of meeting the Congressional deadline to have a contract in place by June 15, 2001. However, there were a number of technical obstacles, not the least of which was involved with creating a new paradigm for conducting a fractional program on a two-year lease basis instead of the industry-standard five year ownership basis and legal issues concerning the concept of operational control of Government aircraft by a private entity. The original RFQ was not published until August 2001. It requested responses by September 30, 2001.

Prospective industry bidders were dismayed at the short time allotted for responses. NASA was in the process of publishing a new RFQ when the tragic events occurred on September 11, 2001. As a result of those events, NASA insisted upon additional changes to the RFQ, notably increasing security requirements for aircraft and personnel provided by the potential bidders. The bidders submitted numerous questions about the RFQ, and on December 18, 2001, NASA held a solicitation conference in Alexandria, VA to address those questions. The revised RFQ was published in February 2002, requesting responses by April 1, 2002, anticipating an award by June. Bids were received and evaluated in April and a selection process completed in June of

2002. A contract was signed in July of that year, and Flexjet was awarded the contract. The contract start date was July 31, 2002.

In accordance with NASA directives, NASA aircraft operations personnel, accompanied by FAA personnel, performed a review of the Flexjet operations facility near Dallas in Richardson, Texas. The review indicated that Flexjet's management, training, operations, and maintenance met or exceeded the standards that NASA required of the contractor.

The demonstration program flight hours consisted of 900 total hours of aircraft availability: 1/2 share of a Learjet 31A (400 hours/year) and 1/16 share of a Learjet 60 (50 hours/year), totaling 450 contracted hours per year.
NASA's Centers, the Jet Propulsion Laboratory, and NASA Headquarters, located nationwide, were each allocated a portion of the total flight hours in an effort to widely disperse the fractional aircraft service. The allocations were calculated based upon of the number of civil service employees at each Center, the distance from the Center to a major airport, and whether or not the particular Center operated its own administrative aircraft (MMA). Year 1 annual allocations ranged from 10 hours to 60 hours (See Figures 3-1 and 3-2.).

Each Center Director designated a single point of contact (POC) to be responsible for scheduling Flexjet requests at each Center and for tracking that Center's allocated flight hours. The POC scheduled the flights through a single Agency-wide program scheduler at the Wallops Flight Facility (WFF) in Virginia. The Wallops scheduler was responsible for coordinating all travel arrangements with Flexjet, for maintaining an active liaison with the respective Center POCs throughout each flight, and for recording and tracking hours and costs associated with the Flexjet contract.

The NASA Headquarters Aircraft Management Office oversaw the program, recommended Center allocations and reallocations, and recommended usage of the NASA Headquarters Reserve allocation to the Assistant Administrator for Management Systems and Facilities.

**Figure 3-1. Year 1 Allocations and Use**

| **Center-Allocated, Unfunded Hours, Year 1** | | | |
|---|---|---|---|
| **Center** | **Allocated** Aug 02-Jul 03 | **Used** Aug 02-Jul 03 | **Remaining** Fr. Yr 1 allocation |
| **HQ** | **60.0** | **92.0** | **-32.0** |
| **ARC** | **55.0** | **42.3** | **12.7** |
| **GRC** | **45.0** | **18.9** | **26.1** |
| **LaRC** | **50.0** | **29.5** | **20.5** |
| **DFRC** | **30.0** | 0.0 | **30.0** |
| **GSFC** | **20.0** | **1.4** | **18.6** |
| **MSFC** | **20.0** | **15.7** | **4.3** |
| **SSC** | **35.0** | **36.1** | **-1.1** |
| **JSC** | **25.0** | **23.5** | **1.5** |
| **KSC** | **20.0** | **11.8** | **8.2** |
| **WFF** | **10.0** | **19.1** | **-9.1** |
| **JPL** | **10.0** | **5.4** | **4.6** |
| **HQ Reserve** | **20** | | **84.3** |
| **Total** | **400.0** | **295.7** | |
| **Non-Center Funded Hours, Year 1** | | | |
| **Center/Program** | **Lear 31 Hrs Purchased** | **Used** | **Remaining** |
| **CAIB** | **13.9** | **13.9** | **0.0** |
| **Subtotal** | **13.9** | **13.9** | **0.0** |
| **Total available** | **0.0** | | |
| **Total remaining** | **84.3** | | |

**Figure 3-2. Year 2 Allocations and Use**

**Center-Allocated, Unfunded Hours, Year 2**

| Center | Allocated 08/03-01/04 | Used 08/03-0104 | Remaining on 01/31/04 | Consolidation 02/01/04 | Used 02/01/04-06/30/04 | Remaining 7/31/2004 |
|---|---|---|---|---|---|---|
| **HQ** | **64.0** | **63.7** | **0.3** | | **137.9** | 0.0 |
| **ARC** | **45.0** | **21.4** | **23.6** | | **12.5** | 0.0 |
| **GRC** | **17.6** | **16.4** | **1.2** | | **23.9** | 0.0 |
| **LaRC** | **40.0** | **10.7** | **29.3** | | **4.3** | 0.0 |
| **DFRC** | **10.0** | 0.0 | **10.0** | | 0.0 | 0.0 |
| **GSFC** | **10.0** | **8.2** | **1.8** | | **32.0** | 0.0 |
| **MSFC** | **13.1** | **12.8** | **0.3** | | **32.6** | 0.0 |
| **SSC** | **30.0** | **5.1** | **24.9** | | **19.7** | 0.0 |
| **JSC** | **30.0** | **3.1** | **26.9** | | 0.0 | 0.0 |
| **KSC** | **30.0** | **5.2** | **24.8** | | **7.1** | 0.0 |
| **WFF** | **22.6** | **21.7** | **0.9** | | **4.8** | 0.0 |
| **JPL** | **5.0** | 0.0 | **5.0** | | 0.0 | 0.0 |
| **PCSE/SSP plus** | | | | | **7.6** | |
| **HQ Reserve** | **125.8** | | **149.0** | **282.4** | **282.4** | **0.0** |
| **Total** | **443.1** | **168.3** | | | | |

**Non-Center Funded Hours, Year 2**

| Center/Program | Lear 31 Hrs Purchased | Used | Remaining |
|---|---|---|---|
| **SSP** | **22.8** | **16.6** | **6.2** |
| **PCSE** | **41.6** | **40.2** | **1.4** |
| **SSP minus** | | | **-6.2** |
| **PCSE minus** | | | **-1.4** |
| **Subtotal** | **64.4** | **56.8** | **0.0** |
| **Total available** | **0.0** | | |
| **Total remaining** | **0.0** | | |

### C. NASA-Flexjet Contract

NASA began the Fractional Aircraft Demonstration Program with a commercial (FAR Part 12) procurement that was accomplished in a *full and open* competition. NASA held a solicitation conference, which was attended by several industry representatives. Of the three companies that bid, two were large, national providers and one was a smaller, four-aircraft regional company. A NASA evaluation board determined that Flexjet had the most competitive bid, and it was awarded the contract. The selection was based upon cost and technical evaluation factors. It was awarded based upon the initial bid; that is, no negotiations were held with the bidders prior to contract award.

The total value of the contract (S-06216G) was $2,821,078.08. The contract specified cabin size, flight and utilization profiles, and performance requirements for the contracted aircraft. It further specified that the contractor would provide monthly reports and Prior Permission Requests for landing at fields that required PPRs. The contract stated that NASA would provide to Flexjet a manifest within 8 business hours of departure, and that Flexjet would provide a full itinerary to NASA within 4 working hours after the flight request was made.

The contracted fees were divided into three areas:

1) Acquisition Lease Fee. Billed on a monthly basis, this included share lease fees, overhead, and any costs not associated with the direct cost of operating the aircraft.
2) Monthly Management Fee. Billed on a monthly basis, this was a fixed fee. This fee was determined in accordance with a published schedule and is proportional to the size of share owned.
3) Occupied hourly fee. Billed on an hourly basis, this rate included all landing fees, fuel, crew travel and all costs normally associated with the direct cost of operating the aircraft. It covered the cost of fuel, maintenance, standard catering and normal landing fees. The hourly fee is charged on the basis of "occupied hours" only. An allowance for ferry and repositioning flights is included in the hourly fee. There are three components to the hourly fee.
    a. Base fee.
    b. Federal Excise Tax as a percentage of the base fee.
    c. Fuel surcharge. The cost of fuel if it exceeded the fuel cost built into the base hourly fee.

At the time of contract award, the standard fractional contract was for a five-year term*, wherein the aircraft shares were purchased at the beginning and sold at the end of the term. In a standard industry contract, the aircraft has a residual value at the end of the five-year term. The aircraft can thus be sold outright or exchanged for continued fractional service. There are also built-in financial disincentives against terminating the fractional purchase after only two years. However, the two-year limitation on the appropriation did not allow the use of a normal industry agreement, necessitating the use of a two-year *lease* agreement in order to accomplish the test, thereby sacrificing any residual value of the purchased aircraft at the end of the test period. (*Note: After the contract was awarded, the industry expanded short-term program options, and subsequently offered a variety of financial arrangements to enhance access to fractional aircraft, including "card programs," which are similar in practice to the use of "phone cards." In this program, a person would buy the hours on a "card" for a selected number of flight hours, and then fly until the specified hours on the card had been used.)

While there are industry common practices regarding available services, the terms of a standard industry fractional aircraft agreement are typically negotiable. In the NASA-Flexjet agreement, the parties agreed to several terms that distinguished the NASA demonstration program from the industry norm. Flexjet offered exceptions to normal industry standards in its bid as described below:

- Two-year lease program instead of 5-year aircraft purchase.
- Waiver of standard minimum 1-hour flight legs.
- Additional security agreements.

  - Security screening required for Flexjet personnel who had direct contact with the aircraft (pilots, mechanics, dispatchers, catering and cleaning personnel).
  - Foreign nationals were prohibited from flying NASA Flexjet aircraft.
  - NASA Flexjet aircraft would not be chartered to other companies.
  - NASA would always fly on Flexjet aircraft, without exception. .No substitute aircraft from third-party operators would pick up NASA passengers.
  - Flights would not originate or land at Washington, DC, Reagan National Airport due to FAA security restrictions.
- Waiver of commercial Taxi Time charge. In effect, the *occupied hourly* rate was thus defined as from *take-off to landing*, instead of the industry standard from *gate- to-gate*.
- No NASA use of limousines, rental cars, catering, alcoholic beverage services, and other similar passenger service and comfort benefits normal to industry practice.
- Waiver of *peak day* restrictions. Flexjet agreed to fly NASA 365 days per year, notwithstanding "peak days" associated with, for example, Thanksgiving, Christmas, or New Year's holidays.
- Flexjet would not use Federal Government or Department of Defense-contracted fuel for the test, but would use commercial sources to refuel its aircraft in an attempt to ensure a fair comparison with service offered in the commercial sector.
- NASA would not use Flexjet for international flights.

**D. Aircraft Selection**

Two primary factors affected NASA's selection of aircraft with which to do the demonstration program: (1) OMB Circular A-126; and, (2) the amount of the Congressional funding.

**OMB Circular A-126.** By regulation, Government aircraft used for official travel must be cost-justified before each trip by comparing the cost of the Government flight to commercial airlines or to other commercial means. NASA acquired smaller aircraft for the test program partly because those aircraft had relatively low operating costs. NASA calculated that this action would allow easier cost-justification of each fractional aircraft trip.

**Congressionally Directed Funding.** NASA calculated that the amount of the funding required the use of smaller aircraft because smaller aircraft would allow directed funds to be used for more aircraft flights, and thus allow more widespread and frequent use of the fractional aircraft for the test program by the nation-wide NASA community.

After the contract was awarded to Flexjet, which used exclusively Bombardier-manufactured aircraft, NASA chose to use the Lear 31A and Lear 60 to conduct the test. Each of those aircraft was capable of transporting up to seven passengers, and each had very different range and payload performance, providing some flexibility to NASA passengers and schedulers. NASA determined that if larger aircraft were required for infrequent trips, the upgrade features proposed by Flexjet could be utilized.

At the time of contract award, the Flexjet fleet consisted of four aircraft types. All aircraft in the fleet were purchased new by Flexjet and outfitted specifically for the Flexjet program. The average age of the Flexjet fleet was approximately 2.5 years. All aircraft were certified to Stage 3 noise requirements and were equipped with the latest air navigation and safety equipment.

The primary aircraft evaluated in the demonstration program were the Learjet 31A and the Learjet 60. Each aircraft had seven passenger seats plus an additional lavatory seat that could be used on very short flights. The Learjet 31A appeared to be an excellent fit for carrying 4 to 6 passengers on short trips. NASA viewed the Learjet 60 as more suitable for high passenger and baggage loading required for supporting longer flights. It had better range and payload performance, a larger cabin, a private lavatory and greater baggage capacity than the Learjet 31A.

Flexjet also introduced two new aircraft for upgrades that were not available at the start of the contract: the Learjet 40, a short-cabin, six-passenger version of the Learjet 45, and the Challenger CL-300, a super-midsize aircraft that could transport eight passengers in comfort coast-to-coast. NASA could not request these aircraft, but nevertheless used them on several trips as a result of operational upgrades at Flexjet's option.

**Table 3-3. The Flexjet Fleet**

| Aircraft | Typical Pax Seats | Cabin Volume (cu ft) | IFR Range (NM) Seats Full | Normal Cruise Speed (kts) |
|---|---|---|---|---|
| Learjet 31 | 7 | 261 | 1,211 | 441 |
| Learjet 40 | 6 | 368 | 1,610 | 442 |
| Learjet 45XR | 8 | 410 | 1,799 | 442 |
| Learjet 60 | 7 | 453 | 2,218 | 453 |
| Challenger CL-300 | 8 | 860 | 2,920 | 459 |
| Challenger CL-604 | 9 | 1,035 | 3,838 | 459 |

# Findings

### A. Fractional Aircraft Ownership as an Alternative to Agency Ownership

The test program clearly demonstrated that fractional ownership could play a valuable, but limited, role in the cost-effective use of NASA MMA. Essentially, fractional ownership is a cost-effective alternative to Agency ownership when demand is highly variable, and /or is less than 150-200 hrs per year. However, when demand is 300 hours per year or greater, Agency ownership is the most cost-effective approach. Fractional ownership as a replacement for Agency ownership is not the most cost-effective approach.

### B. Program Management and Administration

#### 1. Planning, Procurement, and Liability

**Time.** The NASA-Flexjet contract was the first instance of an aircraft fractional ownership agreement implemented in the Federal Government. As such, there was considerable time spent in determining appropriate legal and procurement actions. From the initial Congressional request until contract award took about 1.5 years. Had NASA allowed time for further negotiations following the first bids, the time would have been longer.

**"No-Cost" Service.** NASA allocated hours to its Centers, facilities, and to NASA Headquarters. It did not, however, charge the various NASA organizations for the use of Flexjet service. This doubtless had a positive effect on the frequency and amount that NASA organizations used the service. Although it could not be objectively documented, NASA planners suspected that failure to charge for the service artificially inflated what might otherwise have been neutral or negative demand for flight service. During the final 10 months of the program, Centers were given the opportunity to purchase additional hours beyond their allotments. No Centers were willing to do this. Additionally, when the Columbia Accident Investigation Board requested more hours than available aircraft could provide, NASA exercised a provision of the contract under which it could buy extra shares. When presented with the proposal, CAIB refused the service, citing excessively high cost.

**Operational Control.** NASA and Flexjet spent a considerable amount of time in reaching agreement on the issue of operational control. This issue arose because NASA owned a fractional share of an aircraft that was also used by other private shareholders, and the fact that fractional providers typically used other charter aircraft to fulfill flight requests when a Flexjet aircraft was not available.

Typically, the Government is always responsible for the flight of its aircraft, and thus must have operational control of that aircraft in order to fulfill its responsibility to the public and to its passengers. However, in the case of fractional aircraft ownership, the responsibility for operational control typically shifts from the owner to the fractional provider when the owner is not on board, even though the owner, the Government, in this case, retains ultimate responsibility for the aircraft. In accordance with previous Federal Aviation Administration and National Transportation Safety Board rulings, regardless of who exerts operational control of the aircraft, the owner is ultimately and always responsible for the operation of the aircraft.

Because of this issue, as well as security concerns arising after September 11, 2001, NASA required wording in its contract that NASA passengers would always fly on Flexjet aircraft without exception, and that no substitute aircraft from third party operators would pick up NASA passengers.

**Government Regulation**. The Federal Acquisition Regulations (FARs) do not include provisions for accomplishing typical aircraft fractional ownership agreements. The FARs have a fundamental problem in this regard, in that they allow for only one-year transactions based upon one-year Congressional appropriations. Some of those transactions might be, and often are, accomplished using five-year contracts with multiple one-year options, for example. However, the FARs do not give Government agencies the ability to engage in binding multi-year contracts, such as those required in the fractional aircraft industry in which early termination of the binding agreement would require that the fractional owner pay off the balance of the entire multi-year contract at the time of termination. The Government always retains the ability in its contracts to terminate an agreement. The NASA fractional aircraft test program was conducted under the aegis of a Congressional direction for a two-year test, using NASA-appropriated funds that were specifically directed for the accomplishment of that test. However, under normal circumstances, should a Federal agency desire to enter an industry fractional aircraft agreement, it might find it difficult, if not impossible, to enter into multi-year agreements with the fractional industry because of the limitations of the FARs.

Other Government regulations, such as OMB Circular A-126, require that before a Government agency buys an aircraft, it must perform a cost comparison under the guidelines of OMB Circular A-76 to determine if Government ownership is more beneficial than commercial ownership of the aircraft. A-76 currently contains provisions by which fractional aircraft acquisitions may be compared; that is under the provisions of Government-owned, contractor-operated (GO-CO) aircraft. However, the specific templates formerly in A-76 applicable to aircraft acquisitions are not in the current version of A-76, requiring prospective Government aircraft buyers to use the templates in older versions of the document.

Further, A-126 requires that Government aircraft be cost-justified on a trip-by-trip basis based upon the variable cost of operating those aircraft. In the NASA fractional aircraft test, Flexjet did not provide the actual variable costs to NASA. NASA used the occupied hourly fee, including the fluctuating fuel surcharge, to substitute for the actual variable cost required by A-126.

### 2. Human Resources are critical to program success

The NASA person assigned as the single point-of-contact with Flexjet encountered a very high workload. Manifest changes, mostly passenger and departure time changes, created multiple phone calls and manifest updates. The typical mission required at least 6 phone calls pertaining to late changes in passenger manifests or changes to departure times. The program assigned at the outset a full-time employee specifically to perform the duties of the NASA single point-of-contact with Flexjet. Flexjet operates around-the-clock. The NASA personnel responsible for direct contact with Flexjet were not hired to work around-the-clock, but they ended up fielding many requests during off-duty hours.

Considerable time and effort by NASA personnel were required in the planning, procurement, and operations phases of the test, including personnel involved in aircraft operations, legislative affairs, legal, contracting, and management. The fractional aircraft ownership industry designs its programs to be accomplished with few human resources provided by the owner. However, in the

NASA fractional program, the resources of numerous people were required to accomplish the program.

### C. Aircraft Utilization

The actual hours flown during the demonstration program were somewhat less than the 900 hours (450 per year) contracted for the two-year test. NASA flew a total of 730.8 occupied flight hours during the two-year contract. The reduction in flight hours was due to two factors:

- **Fuel surcharges.** Higher than expected fuel surcharges increased the cost-per-hour prices for each flight. Flight hours were consequently reduced to stay within the funding limits set by the Congressional direction.
- **Upgrades.** NASA passengers frequently requested aircraft upgrades to accommodate larger payloads or increased range requirements. Flexjet accounted for the additional costs by applying an *exchange ratio* to the *occupied hours* flown on the aircraft. Flexjet then billed the fractional owner based upon *adjusted hours*. The cost per flight hour was thus increased, requiring that the total hours be reduced to stay within the directed funding limitation.

Figure 4-1 summarizes the utilization of Flexjet aircraft by type. There were differences between *requested* flights and *actual* flights. Flexjet frequently substituted a larger aircraft for the one requested. These *operational upgrades* were provided for the convenience of Flexjet in meeting its scheduling constraints, and had no cost impact to the NASA program. However, they provided NASA passengers with the benefit of an upgrade to a larger, more comfortable cabin.

**Figure 4-1. Flexjet Aircraft Utilization Summary**

| Aircraft | Requested Flights | Actual Flights | N Miles | Occupied Hrs | Adjusted Hrs | Pax |
|---|---|---|---|---|---|---|
| Learjet 31A | 372 | 231 | 111,265 | 324.5 | 324.5 | 1,217 |
| Learjet 40 | - | 6 | 2,943 | 9.3 | 9.3 | 31 |
| Learjet 45 | 48 | 97 | 46,304 | 129.4 | 148.0 | 593 |
| Learjet 60 | 57 | 98 | 64,506 | 173.1 | 184.7 | 560 |
| CL300 | - | 4 | 2,504 | 5.9 | 5.9 | 24 |
| CL604 | 11 | 52 | 31,587 | 88.6 | 137.0 | 331 |
| | 488 | 488 | 259,109 | 730.8 | 809.4 | 2,756 |

During the two-year program, NASA flew a total of 488 flights (one-way trip segments) on Flexjet aircraft over a distance of 259,106 nautical miles. The NASA Centers having MMA typically used their fractional allotment to meet surge demand when their own aircraft were unavailable. Such was the case with NASA Headquarters, whose Gulfstream III aircraft was operated by the FAA flight department located at Washington's Reagan National Airport. NASA HQ scheduled the Flexjet service only when the FAA-operated aircraft were not available. Additionally, the Space Shuttle Columbia accident created additional demand for aviation assets that was met by both MMA and Flexjet aircraft. At the end of the two-year program, approximately 37% of total Flexjet flights were flown to meet surge demand for NASA Headquarters, including support for the Columbia Accident Investigation Board.

On 25 occasions, NASA upgraded to midsize Learjet 45 or large-cabin Challenger 604 aircraft. The Learjet 45 could accommodate up to eight passengers in standard cabin seats, but lacked the range of the Learjet 60. Baggage capacity was somewhat limited for eight passengers in the

Learjet 45. The much larger Challenger 604 was able to comfortably transport nine passengers coast-to-coast.

Seven months into the first year of the test program, the Columbia tragedy occurred. At that time, all fractional test program hours were reallocated from the NASA Centers to a NASA Headquarters reserve fund, and then used only to support the Columbia Accident Investigation Board. Two months later, NASA Centers again resumed scheduling. Hours were reallocated for the start of the second contract year in August 2004, and then, about six months before contract ended, consolidated again in February 2004, in order to ensure that no flight hours remained at the end of the program, and to permit as many hours as possible to be used by the Centers that had previously shown a higher demand for them than other Centers. NASA completed the program with all funds expended.

**Figure 4-2. Flexjet Utilization by NASA Center**

| User | Flights | N Miles | Occupied Hrs | Adjusted Hrs | Pax |
|---|---|---|---|---|---|
| HQ | 185 | 94,674 | 273.1 | 293.6 | 957 |
| MSFC | 48 | 21,119 | 61.1 | 61.1 | 253 |
| SSC | 42 | 19,420 | 57.4 | 60.9 | 249 |
| ARC | 37 | 25,830 | 69.3 | 76.2 | 170 |
| GRC | 35 | 17,160 | 48.4 | 59.2 | 262 |
| LARC | 30 | 13,937 | 40.0 | 44.5 | 197 |
| WFF | 29 | 14,269 | 38.5 | 45.5 | 177 |
| GSFC | 28 | 13,202 | 36.6 | 41.6 | 185 |
| KSC | 13 | 9,892 | 24.1 | 24.1 | 83 |
| JSC | 12 | 9,476 | 26.6 | 26.6 | 60 |
| PCSE | 12 | 7,630 | 21.8 | 40.2 | 69 |
| CAIB | 8 | 4,961 | 13.9 | 13.9 | 43 |
| SSP | 7 | 6,241 | 16.6 | 16.6 | 42 |
| JPL | 2 | 1,295 | 3.4 | 5.4 | 9 |
| | 488 | 259,106 | 730.8 | 809.4 | 2,756 |

**Figure 4-3 NASA Utilization by Center, 2 years**

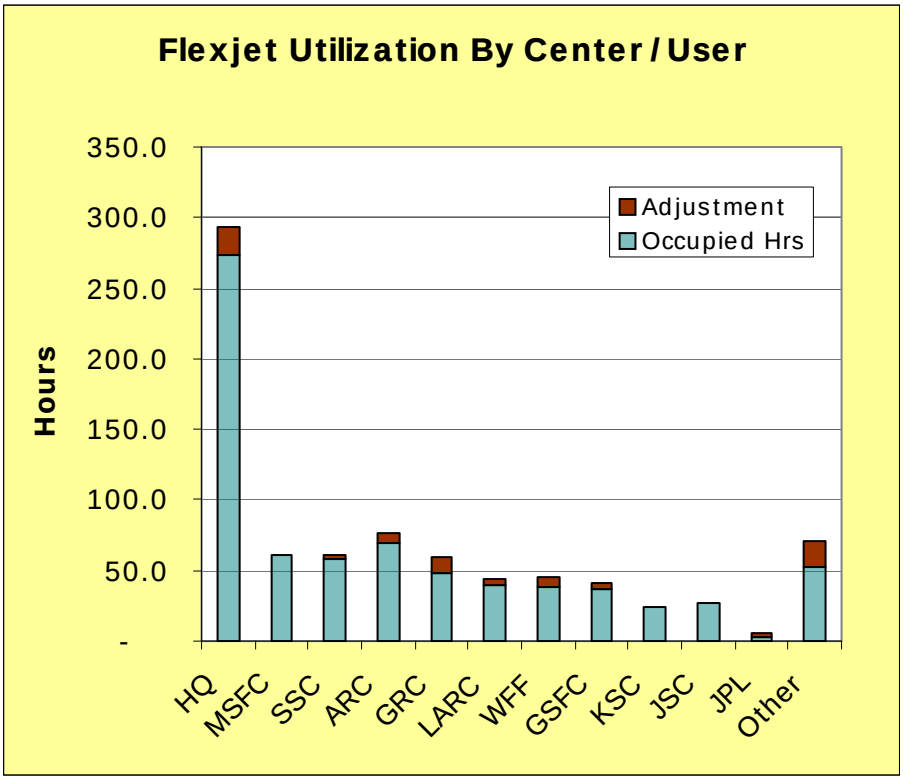
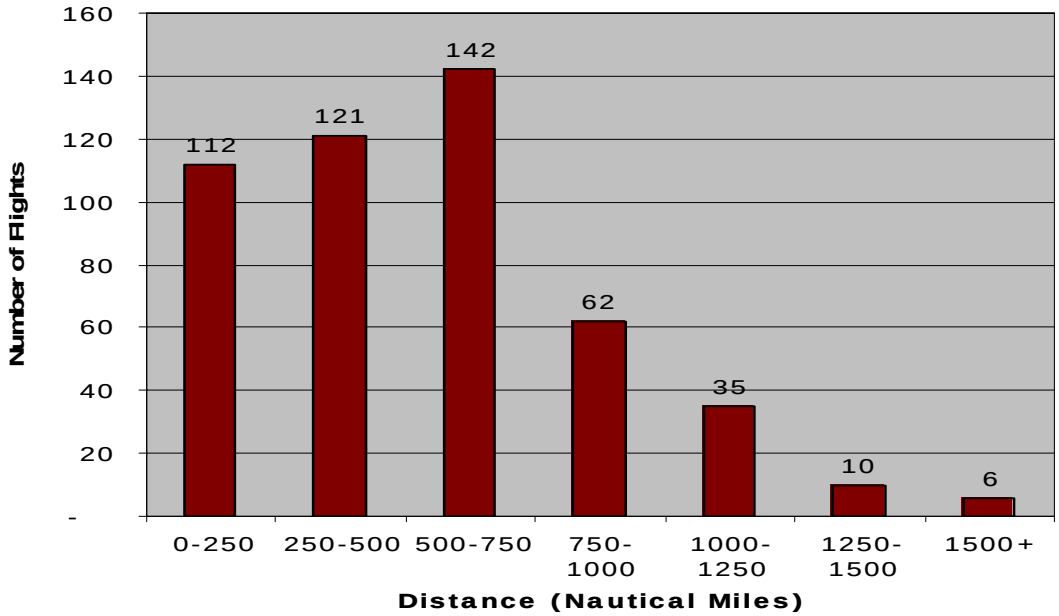



**Figure 4-4 Number of Flexjet Flights versus Distance**



Though NASA Centers are located in different areas of the country, the travel patterns associated with Flexjet usage proved to be similar. Flexjet utilization was characterized by relatively short flights with an average distance of only 531 nm. Only 16 flights (3%) were over 1250 nm, while 112 flights (23%) were under 250 nm. Figure 4-4 profiles Flexjet utilization by distance. The shorter flights might best have been flown on the King Air B-200 if it was available. Utilization effectiveness on jet aircraft nearly always increases with the distance flown.

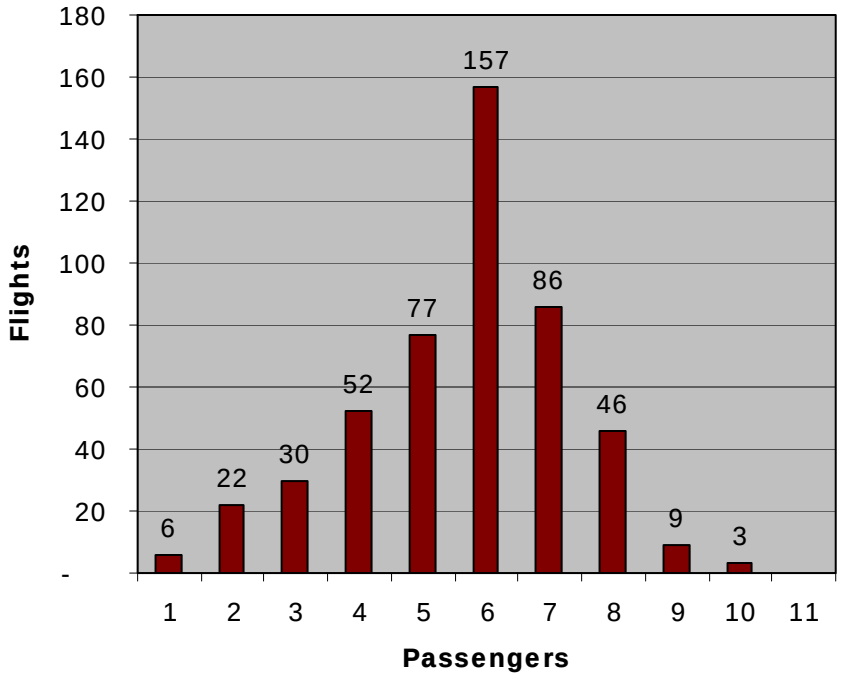
### D. Passenger Loading

The majority of legs were flown on Lear 31A or Lear 60 aircraft. Each aircraft was technically capable of carrying up to seven passengers, but is cramped when fully loaded. These two types of aircraft flew with an average passenger loading of 5.4, maintaining an overall average load-factor of approximately 80percent.

On larger aircraft, such as the Lear 45 or Challenger CL604, 58 flights (8.4%) carried more than seven passengers. Figure 4-5 depicts average Flexjet utilization by passenger load for all types of aircraft.

The higher operating cost of NASA's Gulfstream aircraft typically required the boarding of at least 9 travelers to justify use of the aircraft. Using less expensive seven-passenger aircraft, trips could often be justified with smaller passenger loads.

**Figure 4-5 Flexjet Passenger Loading**



### E. Aircraft Assignment

Flexjet provided larger aircraft for operational upgrades. Operational upgrades were offered by Flexjet to meet its own scheduling contingencies. They were provided to NASA at no additional cost. Upgrades requested by NASA were charged to NASA. They had the effect of reducing total funds to a greater extent than did flights on smaller aircraft, and thus had the effect of reducing the number of otherwise available flights that could be taken on smaller aircraft.

Though it leased only ½ share of a Learjet 31A and 1/16 share of Learjet 60, NASA had access to every aircraft in the Flexjet fleet, primarily because of upgrade features in the agreement. This capability was used on several occasions when the itinerary or passenger loading for a particular trip required an aircraft with additional seating capacity or more range than what could be provided by the leased aircraft. NASA personnel on longer duration flights frequently requested upgrades to larger, longer-range aircraft.

The Flexjet agreement also provided for the simultaneous use of multiple aircraft. On 20 occasions during the program, NASA flew as many as three different aircraft on the same day. On 10 occasions, NASA flew on 4 different aircraft into 3 different geographic regions on the same day.

### F. Program Flexibility

The program contract was for 450 billable hours per year. However, there was some flexibility to carry-over up to 20 percent of program hours from one year to the next, or to borrow hours from the next year if needed, so long as the 900-hour 2-year contract was not exceeded. Furthermore, Flexjet's "Versatility Plus" program allowed any unused contract hours to be "sold" to other shareowners. NASA used both of these features to its advantage.

During year one, NASA used only 248.7 Lear 31A hours. Therefore, 80 available hours (400 x 20 percent) were carried forward to the second year. NASA started the second year of the program with 480 available Lear 31A hours, although directed funds would cover only about 400 hours due to high fuel surcharges.

By using the Versatility Plus program, the 80-hour surplus of unused, but contracted, hours could be made available through Flexjet to other owners and the proceeds could be applied toward additional NASA flights. Indeed, this feature allowed NASA to recapture almost $100,000 in funds, and to use those funds to buy about 60 additional flight hours in the final months of the program. Thus, NASA flew a total of 809.4 billable hours in the program, whereas only 750 hours would have been flown without this feature.

### G. Responsiveness

NASA’s contract with Flexjet required an 8-hour response time between scheduling and passenger pickup. Flexjet, in turn, was required to return the flight itinerary to NASA within 4 hours after the flight request was made. In all cases, Flexjet met or exceeded this requirement. Additionally, Flexjet accommodated numerous late changes and late notice flight requirements, often after working hours and on weekends.

Flexjet responded quickly to operational contingencies. For example, a NASA Flexjet flight diverted to an alternate due to a mechanical issue (loss of weather radar). Within one hour after the diversion, another Flexjet aircraft picked up the passengers and landed at the intended destination less than 2 hours after the planned arrival.

### H. Reliability

During the two-year test, Flexjet provided very consistent service. Every requested Flexjet mission except one was successfully accomplished. The one exception was due to an operational upgrade to an aircraft that did not have the take-off performance required to operate off a wet, short runway. Flexjet dispatchers did not check the destination runway length as it applied to wet runway restrictions prior to assigning the larger aircraft as an upgrade. A NASA B-200 King Air aircraft picked up the stranded passengers. This exception was extensively debriefed with Flexjet personnel and did not reoccur.

### I. Safety

The fractional companies have a comprehensive program to ensure high standards of safety. At the time the NASA test program began, the national fractional aircraft fleet had flown about 500,000 hours and had experienced two incidents (runway overruns in both cases) that resulted in no injuries or fatalities. At the time of program start, there had not been a fatal or serious accident with fractional aircraft since the inception of the fractional programs in the mid-1980s. Flexjet's flight operations were no exception to this safety record. During the two years, no serious accident or incident occurred.

### J. Crew Performance

Flexjet crews operated their aircraft in a safe, timely, and courteous manner. NASA's experience was very positive regarding the performance of the pilots. There were no passenger complaints or negative comments directed toward the pilots.

### K. Customer Surveys

After each flight on a Flexjet aircraft, passengers were asked to complete a survey. The passengers were asked to grade from 1 to 5 (low to high) each of the items listed below.

- Responsiveness
- Timeliness
- Professionalism
- Aircraft suitability
- Safety
- Security
- Service (vs. Mission Management Aircraft)

Overall, passengers gave the service a rating of 4.8 on a 5.0 scale. Figures 4-6 and 4-7 summarize the survey results.

**Figure 4-6 Customer Survey Results 2002-2003**

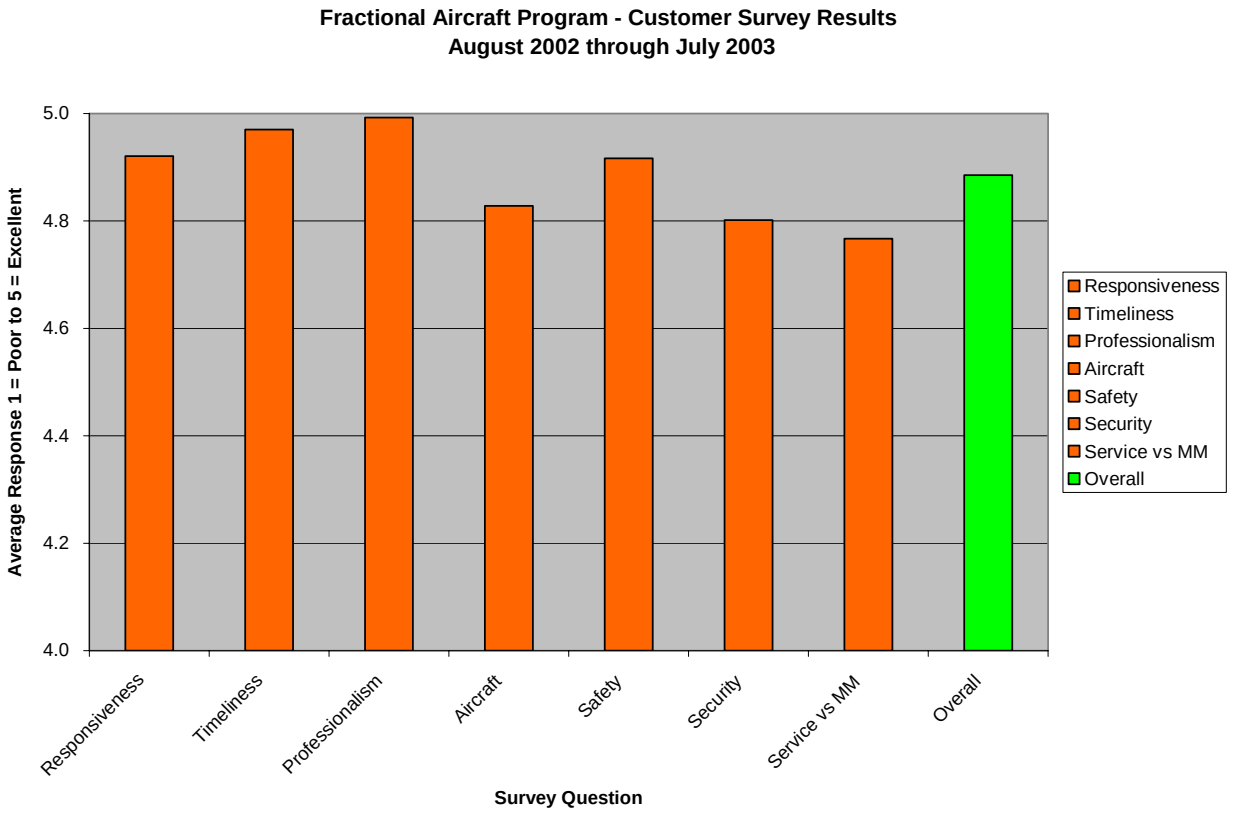
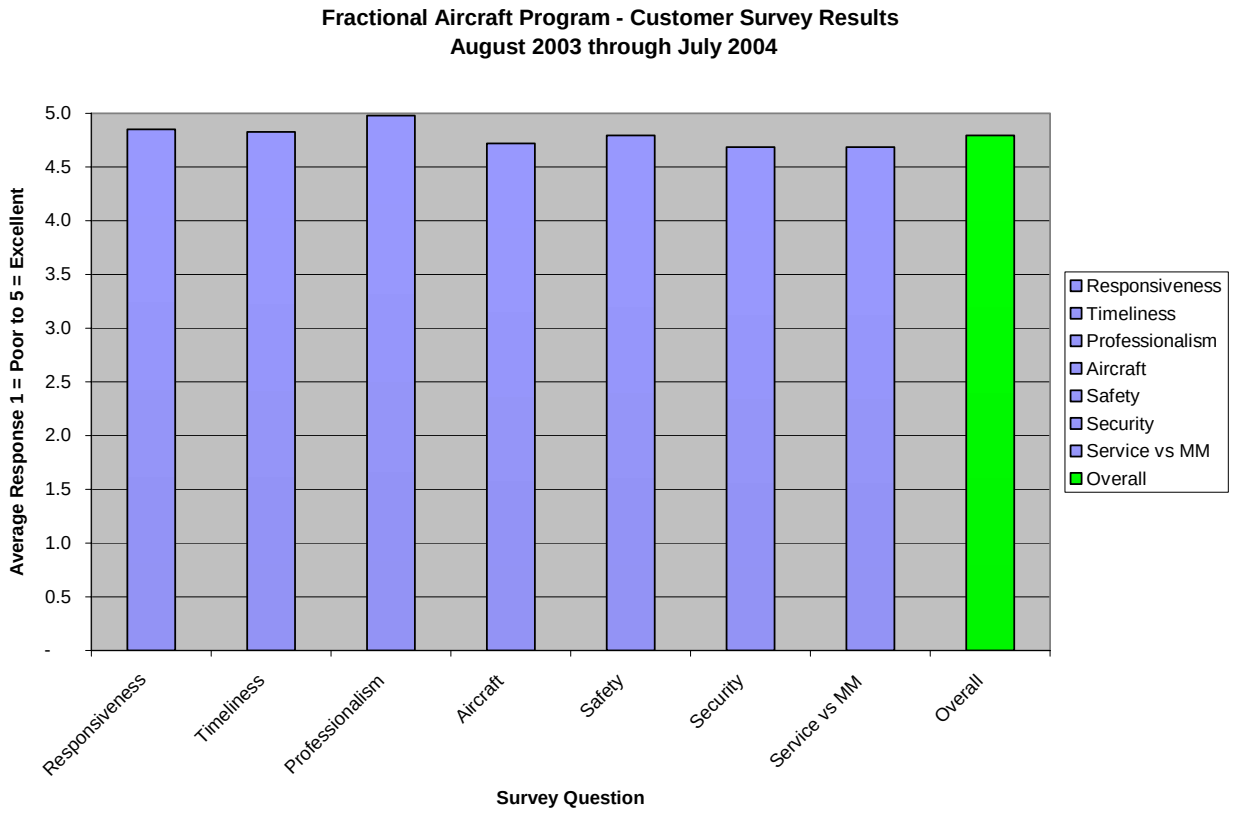

Fractional Aircraft Program - Customer Survey Results
August 2002 through July 2003
Average Response 1 = Poor to 5 = Excellent
5.0
4.8
4.6
4.4
4.2
4.0
Responsiveness
Timeliness
Professionalism
Aircraft
Safety
Security
Service vs MM
Overall
Survey Question
Responsiveness
Timeliness
Professionalism
Aircraft
Safety
Security
Service vs MM
Overall

**Figure 4-7. Customer Survey Results 2003-2004**




### L. Program Costs

Figures 4-8 and 4-9 summarize the costs of the program, less administrative costs (shown separately in Chart 4-10). The total Congressionally directed funding amount available for use was $2,717,000. NASA offered Flexjet services for cost to the Columbia Accident Investigation Board (CAIB), to the Space Shuttle Program ("Return to Flight"), and to the President's Commission on Implementation of United States Space Exploration Policy (PCSE), and planned an additional $154,771for those purposes. The total program funds available were $2,871,771.

From this, a combined total of $47,520 was spent for hiring a contractor as a dispatcher and resource analyst and hiring Conklin & deDecker Associates to assist in writing the final report. In addition, $3,173 was spent on the conference room in which the pre-solicitation conference was held and for a cellular phone for the contractor dispatcher.

The contract was modified within the scope of the contract in September 2002, costing $9,741 to improve the service agreement. That modification indicated that the fuel surcharge assessed by the contractor should be indicated as Bid Item No. 9 and should be shown separately on the invoice, and incorporated the following provisions:

- The contractor guarantees that NASA passengers will always fly on Flexjet aircraft without exception. No substitute aircraft from a third-party operator will ever pick up NASA passengers.
- The contractor will waive peak day restrictions due to the nature of NASA mission travel. Flexjet is prepared to fly NASA 365 days per year if required. The Flexjet Team and Point of Contact will be available 24/7.
- The contractor shall waive Flexjet's standard commercial Taxi Time charge.
- The contractor shall waive short leg limitations. NASA is free to fly all missions without short leg restrictions or minimum charges.

**Figure 4-8. Funds summary of two-year Fractional Aircraft Demonstration**

| **Program Funding** | |
|---|---|
| Original Amount | $ 2,195,000 |
| Supplementary Amount | $ 522,000 |
| Total Amount | **$ 2,717,000** |
| | |
| Program Funds (CAIB, SSP, PCSE) | $ 154,771 |
| **Total Funds Available** | **$ 2,871,771** |
| | |
| **Breakdown of Funds** | |
| Original Flexjet Contract | $ 2,704,086 |
| Mod 1, Terms change | $ 9,741 |
| Mod 2, Transfer to Program Support | $ (47,520) |
| Mod 3, CAIB | $ 43,325 |
| Mod 4, Space Shuttle Support | $ 40,000 |
| Mod 7, PCSE | $ 71,446 |
| Total Contract | $ 2,821,078 |
| | |
| Program Support Contracts | $ 47,520 |
| Other Program Expenses | $ 3,173 |
| **Total** | **$ 2,871,771** |

**Figure 4-9. Summary Contract Costs**

| | Year 1 | Year 2 | Total |
|---|---|---|---|
| **Learjet 31A Contract** | | | |
| Available hours | 400.0 | 400.0 | 800.0 |
| Hours Flown (Adjusted) | 248.7 | 460.7 | 709.4 |
| Variable Costs/Flt Hr | $ 1,620 | $ 1,696 | |
| | | | |
| Total Variable Costs | $ 402,890 | $ 781,529 | $ 1,184,420 |
| Lease + Management Fees | $ 633,096 | $ 649,320 | $ 1,282,416 |
| Subtotal | $ 1,035,986 | $ 1,430,849 | $ 2,466,836 |
| | | | |
| **Learjet 60 Contract** | | | |
| Available hours | 50.0 | 50.0 | 100.0 |
| Hours Flown (Adjusted) | 60.9 | 39.1 | 100.0 |
| Variable Costs/Flt Hr | $ 2,155 | $ 2,161 | |
| | | | |
| Total Variable Costs | $ 131,269 | $ 84,494 | $ 215,762 |
| Lease + Management Fees | $ 117,852 | $ 120,468 | $ 238,320 |
| Subtotal | $ 249,121 | $ 204,962 | $ 454,082 |
| | | | |
| **2-Year Totals** | | | |
| Available hours | 450.0 | 450.0 | 900.0 |
| Hours Flown (Adjusted) | 309.6 | 499.8 | 809.4 |
| | | | |
| Total Variable Costs | $ 534,159 | $ 866,023 | $ 1,400,182 |
| Lease + Management Fees | $ 750,948 | $ 769,788 | $ 1,520,736 |
| | $ 1,285,107 | $ 1,635,811 | $ 2,920,918 |
| | | | |
| Versatility Plus | $ - | $ (99,840) | $ (99,840) |
| | $ 1,285,107 | $ 1,535,971 | $ 2,821,078 |
| | | | |
| Contract Support | | $ 47,520 | $ 47,520 |
| Other Program Expenses | $ 3,173 | | $ 3,173 |
| **Total Program Costs** | **$ 1,285,107** | **$ 1,683,331** | **$ 2,871,771** |

**Figure 4-10. NASA Administrative Overhead -- Civil Service***

| **NASA Personnel Costs -- Civil Service** | | |
|---|---|---|
| (*FTE Estimated Based on FY03 4th Qtr GS-14 Rate of $96,800 | | |
| Plus a 40% Fringe Benefit Rate = $135,500/year.) | | |
| **Personnel description** | **FTE** | **Cost** |
| | $135,500 | |
| **NASA Headquarters** | | |
| Aircraft Management Office | 0.5 | $67,750 |
| Office of Legislative Affairs | 0.2 | $27,100 |
| General Counsel | 0.1 | $13,550 |
| | | |
| **GSFC** | | |
| Procurement | 0.2 | $27,100 |
| | | |
| **WFF** | | |
| Aircraft Management Office | 0.5 | $67,750 |
| Dispatcher/Resource Analyst CS | 1 | $135,500 |
| Procurement Office | 0.5 | $67,750 |
| General Counsel | 0.2 | $27,100 |
| | | |
| **Other NASA Centers** | | |
| Points-of-Contact: | | |
| 11 Centers x .1 FTE | 1.1 | $149,050 |
| | | |
| **Total FTE & Cost** | 4.3 | **$582,650** |

*funds absorbed by NASA

**Figure 4-11. Fractional Ownership Test Program Fee Structure**

| | Learjet 31A | Learjet 60 | Total |
|---|---|---|---|
| **Monthly Lease** | $16,718 | $4,018 | $20,736 |
| **Monthly Management Fee** | $36,040 | $5,803 | $41,843 |
| **Monthly Totals** | $52,758 | $9,821 | $62,579 |
| | | | |
| **Yearly Totals** | $633,096 | $117,852 | $750,948 |
| | | | |
| **Hourly Fixed Costs** | $1,583 | $2,357 | |
| **Occupied Hourly Fee** | $1,245 | $1,658 | |
| **Hourly Fuel Surcharge** | $371 | $415 | |
| **Total Occupied Hourly Fee** | $1,616 | $2,073 | |
| **Total Hourly Fee** | $3,199 | $4,430 | |

# Analysis of Acquisition Alternatives

In order to ensure that Government aviation resources are utilized in the most cost-effective manner, the Office of Management and Budget (OMB) has prescribed Government-wide policies to be followed in *acquiring* and *using* Government aircraft. These policies are codified in two OMB circulars.

- **OMB Circular No. A-76** applies to the *acquisition* of Government aircraft in lieu of equivalent services (such as charter) from the private sector. (*Government aircraft* means any aircraft owned, leased, chartered or rented and operated by an Executive Agency.)
- **OMB Circular A-126** applies to the *use* of a Government aircraft for a specific trip, in lieu of traveling by airlines or other means.

### A. Justifying the Acquisition of Government Aircraft (A-76 Analysis)

Before acquiring aircraft, Government agencies are required to conduct cost comparisons to assure that equivalent services (charter aircraft, contracted aircraft services, etc.) cannot be obtained more economically from the private sector. While requiring that they be performed, the latest version of OMB-Circular A-76 does not outline guidelines for conducting cost comparisons for aircraft, while doing so for other assets and purposes. NASA continues to use the aircraft guidelines outlined in previous versions of the circular. OMB Circular A-76 states:

> "…The Government shall not start or carry on any activity to provide a commercial product or service if the product or service can be procured more economically from a commercial source."

For the purpose of this analysis, *equivalent service* means flying the same number of occupied passenger miles, carrying the same number of passengers while meeting NASA standards for safety, reliability and comfort.

It is important to note that A-76 does not require the user to compare costs of non-equivalent service such as the scheduled airlines. That issue is dealt with under Circular A-126.

### B. Acquisition Alternatives

While it is beyond the scope of this study to conduct a detailed A-76 analysis for each NASA application, it is necessary to look at the alternatives to be evaluated and to understand the relative costs and benefits of each approach:

- **Status quo** – Continue operating the current fleet of Government-owned MMA (Gulfstream II, Gulfstream III, King Air B200). This alternative is characterized by low (or no) acquisition costs, high aircraft operating costs and reduced availability due to maintenance. As the aircraft continue to age, this alternative becomes progressively more costly due to higher maintenance requirements and higher costs for fuel. This alternative is most attractive for applications where aircraft utilization is low but circumstances preclude the use of commercial alternatives. However, the current situation at NASA is characterized by high demand for air travel, which, in nearly all cases, uses the NASA MMA fleet to its maximum. This sets up a cycle of proportionately escalating costs for maintenance and fuel as opposed to using newer, more cost-efficient aircraft.

- **New aircraft** – Acquire modern, cost-effective replacement aircraft as recommended in the *Mission Management Aircraft Fleet Plan.* When compared to the status quo, this alternative is characterized by higher acquisition costs, much lower aircraft operating costs, and excellent aircraft availability. It is an attractive alternative for NASA, where the infrastructure to operate aircraft must exist for the conduct of research and program support missions, and where there is a consistently strong demand for passenger service. Unlike the status quo, cost-effectiveness can be achieved while utilizing the aircraft resources to their fullest extent, typically 400-600 hours annually, and at the same time minimizing maintenance and fuel costs.

- **Charter --** The use of a charter service does not require the existence of or investment in an aviation infrastructure. It requires no long-term investment in aircraft assets, and therefore is characterized by having low fixed annual costs. In some cases, a charter is the most economical alternative to aircraft acquisition, but there are also disadvantages to its use. Aircraft charter availability can be low or non-existent. The costs of empty ferry flights to-and-from a passenger pick-up point can outweigh any savings if a charter aircraft has to be flown from a remote location. Reliability and quality of service are not consistent across this portion of the aviation industry. A charter service is the most affordable when the charter aircraft is based very near the source of the primary requirement and when it is used for short, day-long trips when its use can minimize crew waiting periods and Agency travel costs. Therefore, charter services, when not used in the most cost-conscious manner, can erode any savings they might otherwise provide.

- **Fractional Ownership**– Like charter services, fractional aircraft services do not require the existence of or investment in an aviation infrastructure. They provide many of the benefits of aircraft ownership, such as tax advantages for commercial users and the actual ownership of a share of an aircraft that can be sold when the service is no longer required. They are ideal for organizations that do not have sufficient demand to justify the fixed costs of owning/operating an aircraft full-time. The typical decision point in a commercial setting for determining the usefulness of fractional aircraft services, as opposed to outright purchase of aircraft, lies somewhere between (depending upon the publication) 150 to 250 flight hours per year. Typically, an organization that routinely flies above this decision point, as does NASA at 400-500 hours per year in most aircraft, and 800 hours per year in others, should more appropriately invest in the outright purchase of aircraft. Fractional programs offer users the benefit of scaling the acquisition to meet anticipated demand by buying only the shares that are needed. Thus *fixed* costs, including depreciation and capital costs, actually vary directly with the size of the program. In the following examples, it is assumed that fractional aircraft acquired are perfectly matched to the demand.

**Figure 5-1. Comparison of Aircraft Acquisition Alternatives**

**Cost Per Nautical Mile***

*Flexjet 2 Yr. Avg. does not include NASA administrative or overhead costs.

| | Annual NM/Yr. (K) | $/NM |
|---|---|---|
| Flexjet 2 Yr Avg. | 130 | $ 11.30 |
| Current MMA Baseline | 1,290 | $ 11.03 |
| Preferred Solution | 1,591 | $ 8.65 |
| Low Acquisition Cost Solution | 1,629 | $ 8.02 |
| Most Capable Solution | 1,591 | $ 9.62 |

**Example 1. GSFC/WFF Operations**

NASA currently operates two King Air B200s as MMA, one based at Wallops Flight Facility (WFF) and the other at Dryden Flight Research Facility (DFRC). The B200 is an efficient, safe and dependable aircraft. Its performance is well suited to short trips, typically those under 200 nautical miles.

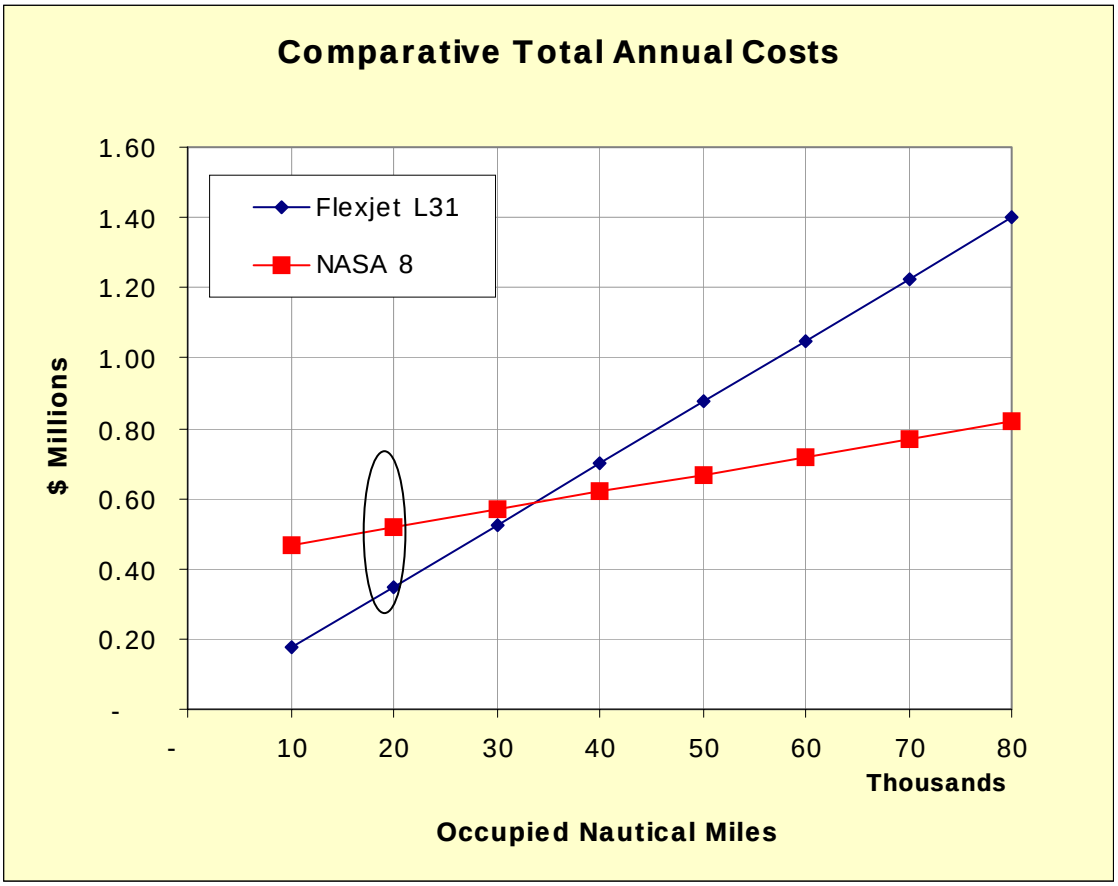
NASA 8 is used primarily for utility transport between WFF and GSFC (via Baltimore-Washington International), a 93 NM trip that normally takes about 35 minutes each way. The B200 aircraft is based at WFF, however about half of all passenger trips originate from GSFC or other locations. As a result, about 35% of mileage flown is for aircraft positioning flights.

An analysis of a recent 12-month period indicated that the aircraft flew approximately 20,000 occupied nautical miles annually at an annual cost (including capital and depreciation) of about $520,000. Equivalent Flexjet Lear 31A service (100 occupied hours annually) would cost about $350,000 based on the NASA agreement. However, the NASA test program is unique in that it does not apply a minimum flight time per leg, and NASA is not charged the typical 6-minute taxi time. If the standard one-hour minimum was applied to all legs and taxi time was included, Flexjet costs would increase nearly 50% and the prospective cost advantage would be lost. Figure 5-2 compares alternatives at various utilization levels. In this example, the Flexjet Lear 31 has a cost advantage up to 30,000 occupied NM (representing 3/16 share). If the standard one-hour minimum were applied (represented by the dotted line), Flexjet would only have a cost advantage when utilization is below 20,000 occupied miles.

At higher utilization levels, the B200 has the advantage, even if 35% of flights are positioning flights. Also, the King Air B200 is probably better suited for its utility mission than the performance-oriented Learjet. However, the Learjet 31 would open opportunities to fly to more distant destinations and NASA Centers such as KSC and MSFC. Additionally, NASA 8 flights supporting longer distances typically require the crew to wait one or more days to return, which increases crew travel costs and lowers the availability of the aircraft while on those trips.

Note: For comparison purposes, WFF management obtained quotes for replicating this service with chartered Falcon 10 and Falcon 100 aircraft. The quotes indicated an annual cost of between $333,000 and $351,000. These costs are comparable to the cost of Flexjet service.

**Figure 5-2. GSFC/WFF Alternatives**




**Example 2. California Operations**

NASA's three California facilities currently share a single MMA, a King Air B200, which is based at Dryden and contractor operated and maintained. The aircraft is used almost exclusively to fly short trips between DFRC, Ames Research Center (ARC), Burbank and the Jet Propulsion Laboratory (JPL) Goldstone facility. The B200 is well suited for these short trips but does not have the speed/range capability to support travel to other NASA Centers.

The King Air is reasonably well utilized. In FY 2003, it flew 350 flight legs (318 hours) at an average of only .9 hours per leg. Many of these flights are aircraft repositioning flights, resulting in an average passenger load on only 1.8 passengers per leg. This is to be expected when a single aircraft must serve several sites.

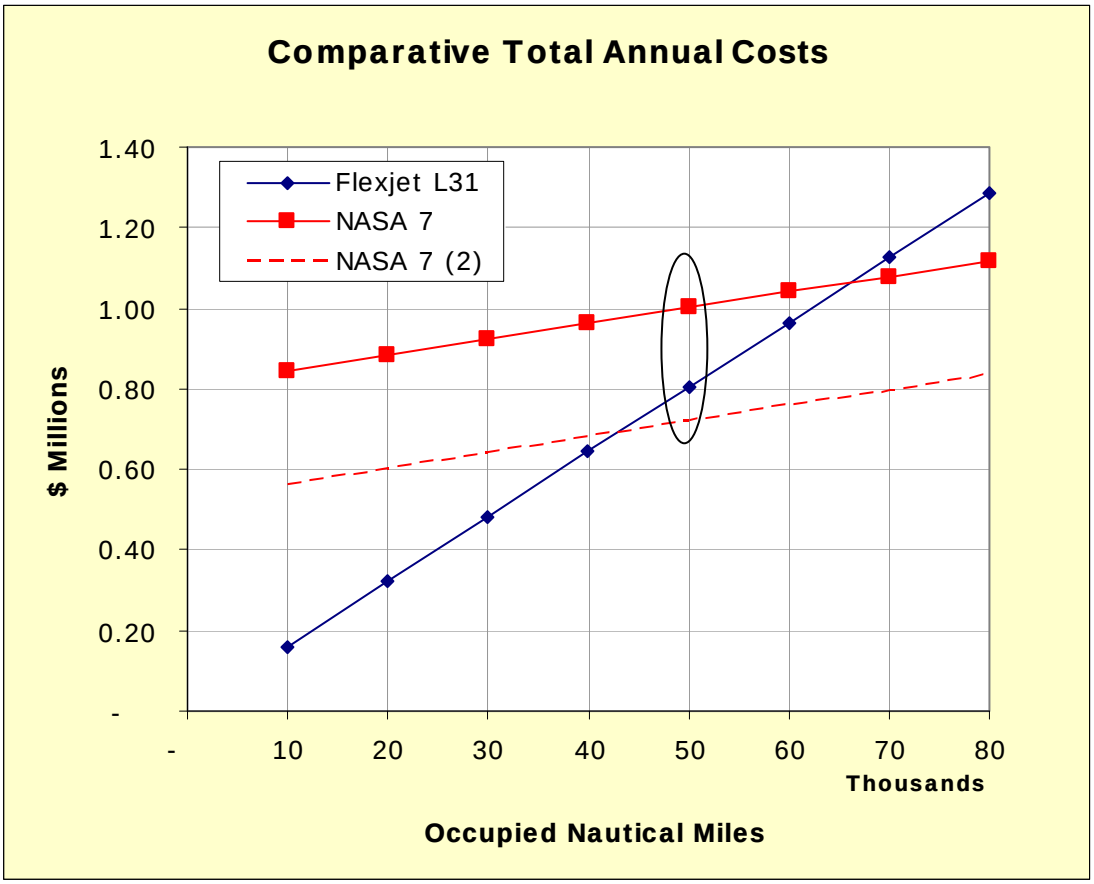
FY 2003 summary data indicates that NASA 7 flies about 50,000 occupied NM annually, at a total cost of about $1.0 million. The 2004 *Fleet Plan* found that DFRC NASA 7 operating costs were higher than expected and that DFRC could reduce them by initiating cost-cutting measures. Equivalent Flexjet service (250 occupied hours, new Learjet 31) was estimated to cost about

$850,000. However, combining service in a new MMA with ARC, JPL, and DFRC indicated that it would be cost-beneficial to acquire a super-midsize jet to accommodate the passenger demand for national travel created by those three Centers.

In this example, (Figure 5-3) the Flexjet Learjet 31 has the cost advantage up to about 60,000 occupied miles annually (3/8 share). However, if successful cost-saving measures were implemented (represented by the dashed red line), the advantage would shift to the Government-owned B200 at a lower utilization number.

Again, the Learjet 31 may not be the best aircraft for this mission. Other possible alternatives are a Citation Ultra (several sources) or King Air B200 (Flight Options).

**Figure 5-3. California B200 Alternatives**



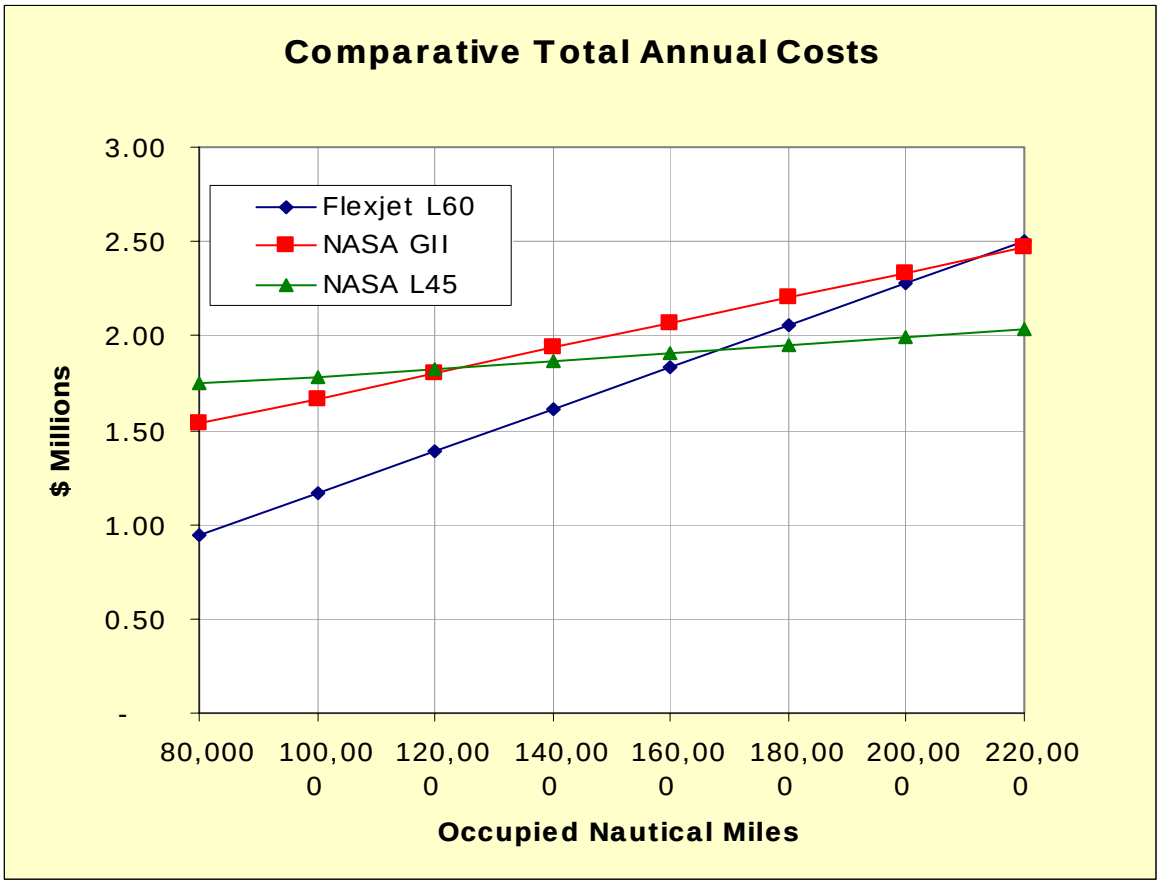
**Example 3. Gulfstream II MMA Operations**
Three Gulfstream IIs – purchased by Johnson Space Center (JSC) as future replacement aircraft for aging Space Shuttle Training Aircraft (STA) are being used temporarily as MMAby KSC, MSFC and JSC. The *2004 MMA Fleet Plan* recommended replacing these aircraft with new or late model midsize business jets such as the Learjet 45 or Citation XLS.

The example outlined in Figure 5-4 compares the total annual cost of operating the current KSC G-II to that of operating a new NASA-owned Learjet 45 and to that of equivalent Flexjet Learjet 60 service. In each case, the cost of capital and depreciation is included.

At low utilization levels, Flexjet is clearly the lowest cost solution due to the scalability of fixed costs. At higher utilization, the cost advantage shifts to new NASA-owned aircraft. At no time is the aging G-II the lowest cost alternative.

Other alternative aircraft could be evaluated, including late model used aircraft, but the general principle remains the same. There is a crossover point in aircraft demand below which fractional programs cost less than full aircraft ownership. The specific crossover point will vary according to a number of influences such as the number of repositioning flights and the specific terms of the fractional ownership contract.

**Figure 5-4. Gulfstream II Alternatives**




### C. Justifying the Use of Government Aircraft (A-126 Analysis)

In most cases, before a Government aircraft can be used for official transportation, it must be determined that "the actual cost of using a Government aircraft is not more than the cost of using commercial airline or aircraft (including charter) service."

This determination is made on a trip-by-trip basis under the guidelines spelled out in **OMB Circular A-126**. The important points to remember when doing A-126 cost justification are:

- For Government-owned aircraft, only the ***variable operating cost*** (often referred to as Direct Operating Cost --DOC) is used, not the *total* operating cost. Variable costs include fuel, maintenance (including an allowance for engine overhaul) and any other costs that vary directly with the operation of the aircraft. This factor tends to strongly favor newer, Government-owned aircraft because their variable operating costs are normally very low. Older aircraft like the Gulfstream II become increasingly difficult to cost-justify because of high maintenance costs.
- The cost of any ***aircraft positioning flights must be included*** in the total. This factor tends to discourage the sharing of current MMA among NASA Centers**.**
- For fractional aircraft programs, variable costs consist of ***occupied hourly rate*** plus any ***fuel surcharge***. Fixed costs such as management fees and monthly rent are not included.

- For charter aircraft, the entire cost of the trip must be counted including aircraft positioning, wait time, minimum usage requirements, etc. It is very difficult to cost-justify the use of charter aircraft because *all costs are treated as variable costs*. However, the cost of charter air service can be comparable, in terms of cost, with fractional ownership services. The costs from the customer's point-of-view are treated as variable costs.
- The total cost of travel includes personal travel expenses (air fare, auto, hotel, meals, etc.) plus the economic value of each employee's ***door-to-door travel time***. NASA has established a precedent of valuing time at 2.5 times the employee's total compensation including benefits. The National Business Aircraft Association (NBAA) uses an average of 6.5 as a multiplier for valuing an employee's time. Even higher multipliers are applied to corporate officers with high pay levels.
-

Using cost databases developed by Conklin & deDecker and the Travel$ense tool developed by the National Business Aircraft Association (NBAA), NASA tested several hypothetical trip scenarios comparing total trip costs for groups traveling by:

- Commercial airlines (and/or car when appropriate);
- Current NASA-owned aircraft (G-II, G-III, King Air B200);
- Recommended cost-effective replacement aircraft (Citation X, Gulfstream 200, Learjet 45, etc.);
- Charter aircraft (equivalent aircraft based on availability); and,
- Flexjet (Learjet 31, Learjet 45, Learjet 60, etc.).

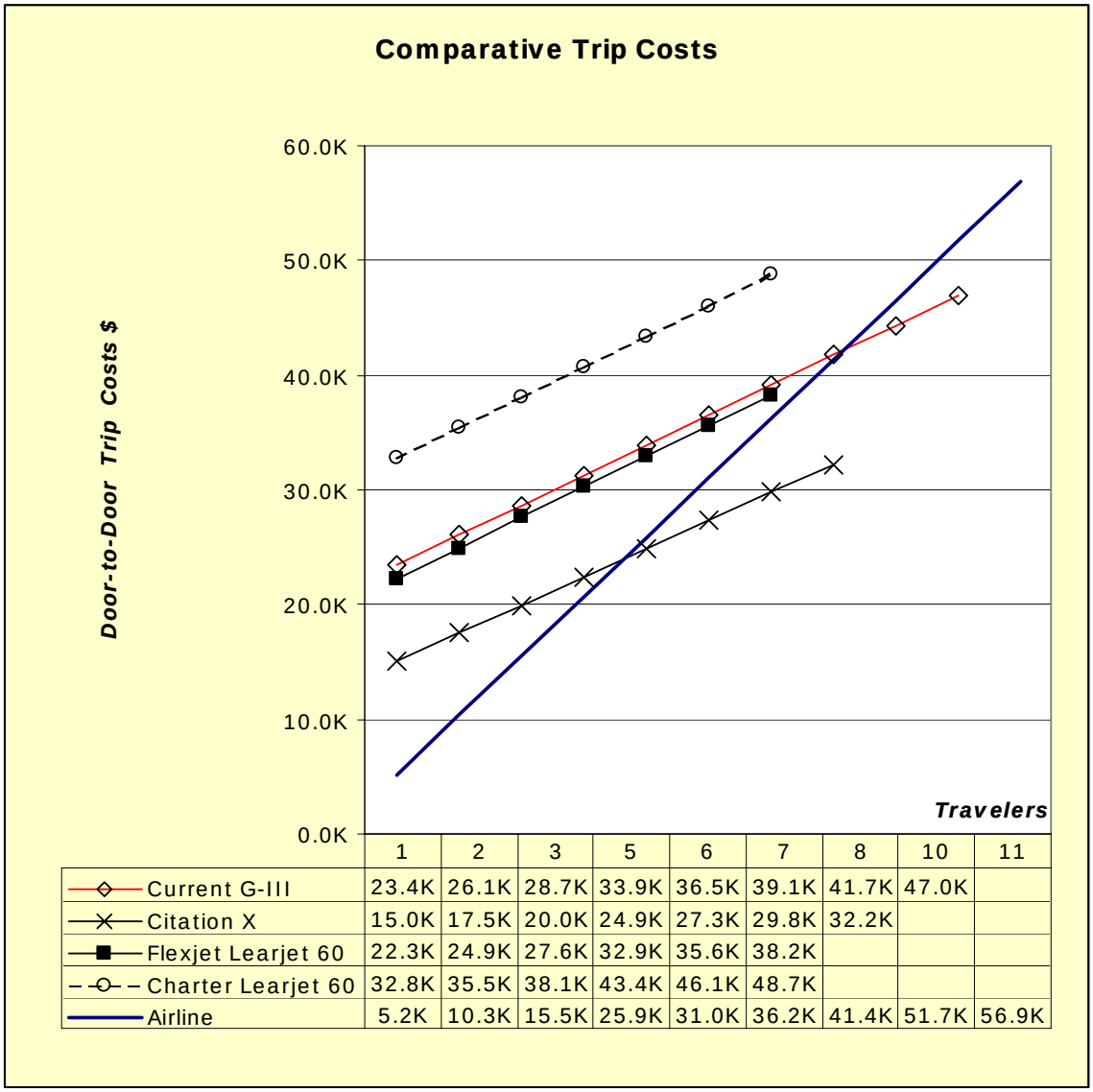
The following assumptions were used in performing this analysis:

- Airfares are based on GSA non-restricted fares;
- Individual travel expenses are Travel$ense defaults;
- Airline flights are automatically picked by Travel$ense to provide required on-site time;
- Government jet fuel costs are $1.30/gal.;
- Average salary plus benefits are valued at $80/hour; and,
- Time value multiplier is 2.5.

Use of the MMA is cost-justified when the combined savings of a group traveling together are enough to cover the costs of operating the aircraft. In most cases, the primary quantifiable benefit is the non-productive travel time saved by individual travelers. This time is accounted for in the cost comparison made prior to each flight by the use of an "executive multiplier." In most trip scenarios, use of a business jet saves each traveler 1-2 travel days and an overnight stay compared to commercial airlines. This is supported by interviews with travelers of all positions and grades.

**Trip scenario 1**

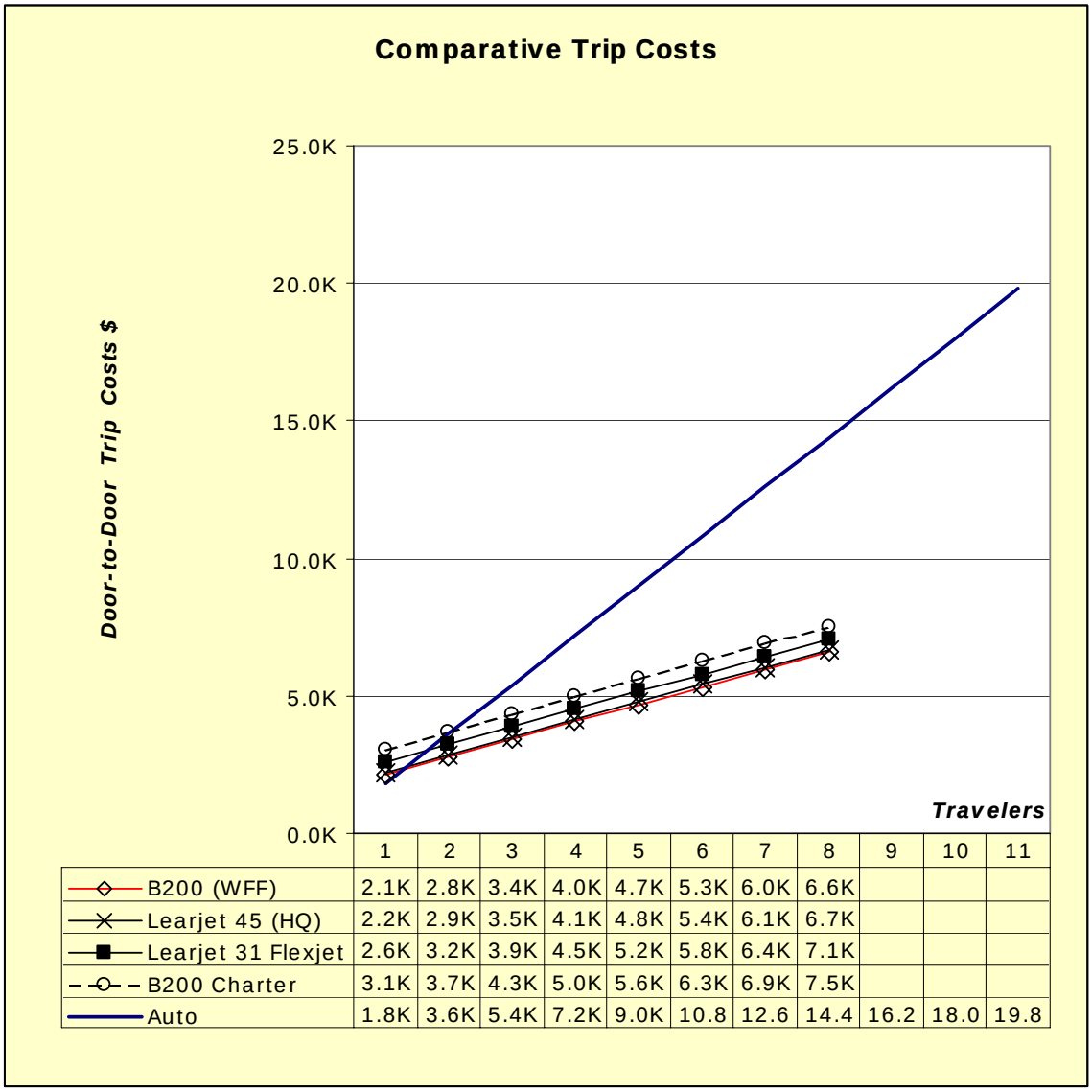
**Figure 5-5. Scenario description: HQ-ARC-HQ**




| | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|
| Current G-III | 23.4K | 26.1K | 28.7K | 33.9K | 36.5K | 39.1K | 41.7K | 47.0K | |
| Citation X | 15.0K | 17.5K | 20.0K | 24.9K | 27.3K | 29.8K | 32.2K | | |
| Flexjet Learjet 60 | 22.3K | 24.9K | 27.6K | 32.9K | 35.6K | 38.2K | | | |
| Charter Learjet 60 | 32.8K | 35.5K | 38.1K | 43.4K | 46.1K | 48.7K | | | |
| Airline | 5.2K | 10.3K | 15.5K | 25.9K | 31.0K | 36.2K | 41.4K | 51.7K | 56.9K |

**Trip scenario 2**

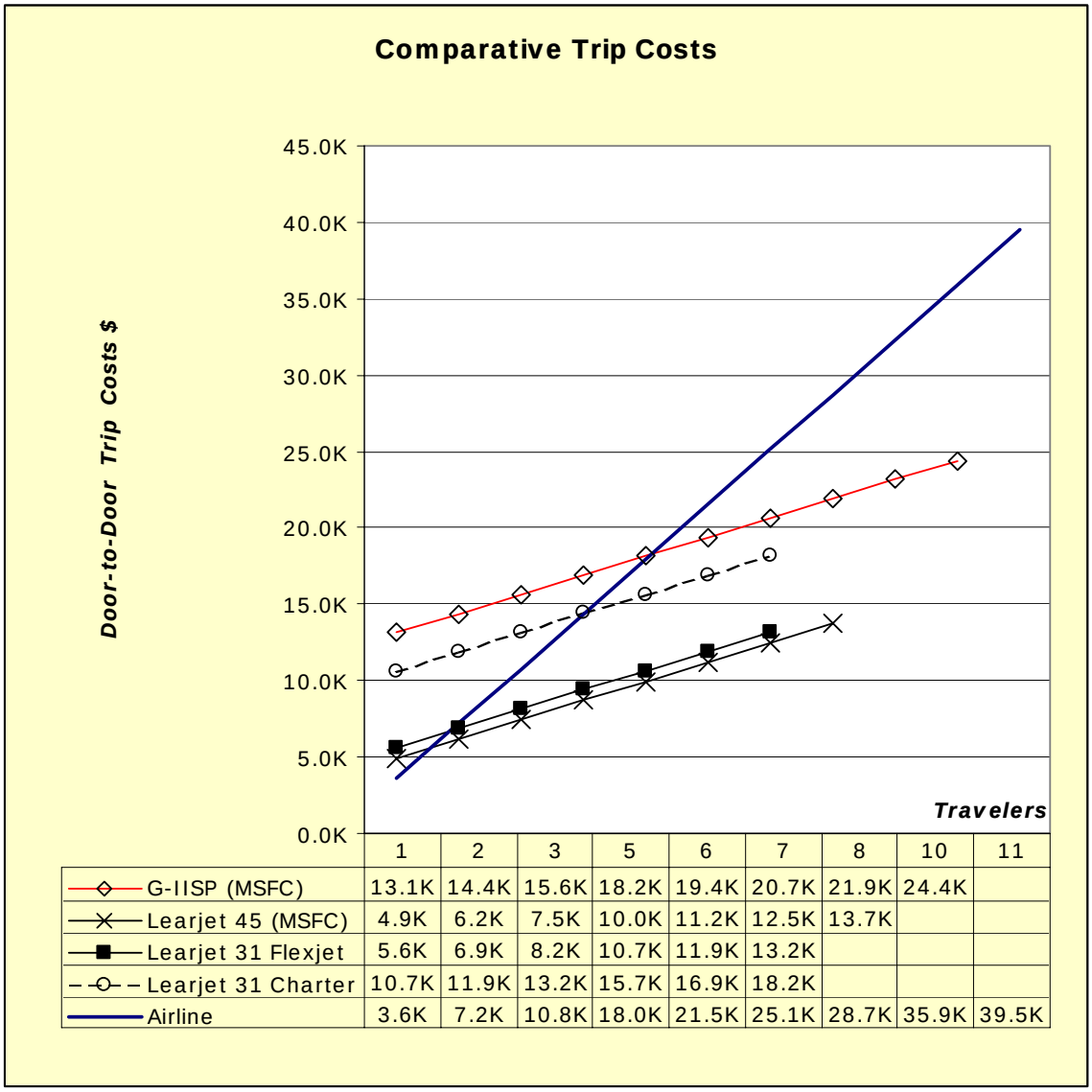
**Figure 5-6. Scenario description: GSFC-WFF-GSFC**




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B200 (WFF) | 2.1K | 2.8K | 3.4K | 4.0K | 4.7K | 5.3K | 6.0K | 6.6K | | | |
| Learjet 45 (HQ) | 2.2K | 2.9K | 3.5K | 4.1K | 4.8K | 5.4K | 6.1K | 6.7K | | | |
| Learjet 31 Flexjet | 2.6K | 3.2K | 3.9K | 4.5K | 5.2K | 5.8K | 6.4K | 7.1K | | | |
| B200 Charter | 3.1K | 3.7K | 4.3K | 5.0K | 5.6K | 6.3K | 6.9K | 7.5K | | | |
| Auto | 1.8K | 3.6K | 5.4K | 7.2K | 9.0K | 10.8 | 12.6 | 14.4 | 16.2 | 18.0 | 19.8 |

**Trip Scenario 3.**

**Figure 5-7. Scenario Description: SSC-KSC-SSC**




| | 1 | 2 | 3 | 5 | 6 | 7 | 8 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|
| G-IISP (MSFC) | 13.1K | 14.4K | 15.6K | 18.2K | 19.4K | 20.7K | 21.9K | 24.4K | |
| Learjet 45 (MSFC) | 4.9K | 6.2K | 7.5K | 10.0K | 11.2K | 12.5K | 13.7K | | |
| Learjet 31 Flexjet | 5.6K | 6.9K | 8.2K | 10.7K | 11.9K | 13.2K | | | |
| Learjet 31 Charter | 10.7K | 11.9K | 13.2K | 15.7K | 16.9K | 18.2K | | | |
| Airline | 3.6K | 7.2K | 10.8K | 18.0K | 21.5K | 25.1K | 28.7K | 35.9K | 39.5K |

# Recommendations and Next Steps

**A. Modernize the NASA MMA fleet. (NOTE: NASA does not plan to pursue this recommendation at this time) Implement the following plan:**

- Replace four old Gulfstream aircraft with six new, smaller aircraft.
  - Provides a 23% increase in mission capability (nautical miles/year);
  - Provides a 38% reduction in cost per mile;
  - Center aircraft should be replaced or utilized as follows:
    - NASA Headquarters -- Replace Gulfstream III with a new super midsize business jet (Gulfstream 200, Citation X, etc.). Note: Recommended acquisition of an additional new midsize business jet (Learjet 45XR, Citation XLS, etc.) to meet excess demand.
    - ARC/JPL/DFRC -- Acquire a new super midsize business jet to provide a needed link with Headquarters and West Coast Centers.
    - JSC, KSC, MSFC -- Acquire four new midsize business jets (Learjet 45XR, Citation XLS, etc.) Return three Gulfstream II aircraft to their primary role as backup Shuttle Trainer Aircraft. (STA)
    - GSFC (WFF) -- Retain current King Air B200. Increase utilization. AMO suggested alternative is a new midsize business jet (Learjet 45XR, Citation XLS, etc.) based at LaRC.
    - DFRC -- Retain current King Air B200, review cost allocation under "full-cost accounting" with the goal of lowering costs and standardizing cost reporting methods.
    - JSC (ISS Mission) -- Replace Gulfstream I with a used Gulfstream III for MMA and ISS use. A-76 study completed and supports this recommendation.

**B. Use Fractional Ownership Service as a part of NASA MMA fleet modernization.**

Acquire aircraft fractional aircraft services to supplement NASA's fleet of MMA. Given NASA's current fleet composition, it is recommended that 350 hours per year of fractional services be procured. As the MMA fleet is upgraded to the recommended composition of a slightly larger fleet of newer, smaller aircraft, the number of fractional hours required will be reduced to approximately 100 hours per year.

Modernizing NASA's fleet of MMA will increase NASA's ability to meet the current demand for aviation passenger service. However, the addition of aircraft fractional ownership service for NASA would enhance NASA's ability to respond to contingencies, allow for surges in demand due to unknown factors, and allow for greater flexibility in conducting Agency missions.

Implementing fractional aircraft ownership programs to replace MMA would not reduce current costs associated with maintaining NASA's aviation infrastructure that is required to support the fleet of nearly 80 other NASA aircraft. The NASA Centers that conduct aircraft operations in support of space flight and exploration, aeronautical and science research that also support MMA can more cost-effectively continue to provide MMA support in addition to the operations associated with other NASA missions. However, as a supplement to NASA MMA, fractional aircraft ownership (or lease) programs can fill a gap in demand that can be created by unknown or unforeseen circumstances.

**C. Full time, dedicated personnel are critical to manage the program's daily operation**

Ensure that more than one person is assigned as the single-point-of-contact for the Agency in coordinating daily requests, schedules, and changes with the aircraft fractional provider. The operation should be planned as a "round-the-clock" operation. Those personnel should be assigned to the NASA Headquarters office that currently oversees use of the FAA aircraft operation, and that office assigned responsibility to manage any permanent fractional program.

**D. Make contracts clear**

Ensure that the financial charges and the full ramifications concerning contract language such as fuel surcharges, flexibility programs, scheduling limitations, and the like are planned, implemented, communicated to all managers and prospective passengers, and entered appropriately in the contract.

**E. Award on Initial Offerors/Bids**

In the interest of obtaining the most cost-beneficial products and services available, the Government should make clear in any solicitation that the Government intends to award on initial offers. It should strongly encourage offerors to propose their best deals (that is, the most cost-beneficial service possible) in their initial submissions. If for whatever reason the Government has questions, concerns, or unknowns regarding an offer that make it difficult for the Government to award on the initial bid, then, and only then, should the Government open up discussions for all. If discussions are opened for one, they must be opened for all. Once the Government opens up for discussions, all offerors will have another opportunity to submit a revision to their offers.

**F. Increase the Multiplier**

Increase the value of the NASA multiplier used to value an employee's productive time lost while flying on commercial airlines from the value 2.5 to a number commensurate with industry standards (6.5 is a conservative industry median). Doing so will more accurately reflect the value of the NASA MMA fleet as compared to travel on commercial airlines.

**G. Charge a Fee for Service**

NASA Centers and programs did not pay for flights that their personnel flew on Flexjet aircraft. The directed funding was levied at the Agency level and allocations based on factors described in this report. To the individual passenger, this was a "free" service. As a result, demand may have been stimulated purely by that fact. Additionally, some users demanded a larger aircraft solely to avoid a fuel stop. Such use, when not based on an increased number of passengers or other business reason, consumes flight hours at a rate of 1.7 times the rate for a smaller aircraft appropriate to the passenger load. All users should be charged a fee for use of the fractional aircraft service to avoid "creating demand," and to ensure the most efficient use of resources. The fee should be based on an equitable portion of the contract, such as the occupied hourly rate plus the price of the fuel surcharge.

**H. Consider all costs in planning to use a fractional ownership program**

A fractional aircraft ownership program includes more than just the cost of flight hours. The total of all costs, including current and inflating fees, as well as overhead associated with the

use of Government resources, should be considered in planning to implement an aircraft fractional ownership (or lease) program.

# Appendix

**NASA-Flexjet Contract Aircraft Fractional Ownership Demonstration Program**